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SOUTH WOOD TIMBER SALE PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT
RESOURCE APPENDICES

Department of Natural Resources and Conservation
Swan River State Forest

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**INTRODUCTION TO RESOURCE APPENDICES
FOR THE SOUTH WOOD TIMBER SALE PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)**

The following appendices are a part of the South Wood Timber Sale Project FEIS (bound separately). The ID Team members prepared the resource appendices; the discussions include citations from other sources such as research documents, environmental assessments, etc. The lengthy technical discussions of methodologies, research, monitoring, baseline studies, analyses, etc., completed by the ID Team are presented in these appendices. The information in the appendices would need to be utilized for any scientific, technical, or legal review.

SOUTH WOOD TIMBER SALE PROJECT

ACRONYMS

ARM	Administrative Rules of Montana	LAU	Lynx Analysis Unit
BMP	Best Management Practices	LWD	Large Woody Debris
dbh	Diameter at Breast Height	MBF	thousand board feet
DEQ	Department of Environmental Quality	MBTSG	Montana Bull Trout Scientific Group
DFWP	Montana Department of Fish, Wildlife and Parks	MCA	Montana Codes Annotated
DEIS	Draft Environmental Impact Statement	MEPA	Montana Environmental Policy Act
DNRC	Department of Natural Resources and Conservation	MAPA	Montana Administrative Procedures Act
EA	Environmental Assessment	MMBF	Million Board Feet
EAC	Environmental Assessment Checklist	NCDE	Northern Continental Divide Ecosystem
ECA	Equivalent Clearcut Acres	NWLO	Northwestern Land Office
EIS	Environmental Impact Statement	SB	Senate Bill
FEIS	Final Environmental Impact Statement	SFLMP	State Forest Land Management Plan
FI	Forest Improvement	SLI	Stand-level Inventory
FNF	Flathead National Forest	SMZ	Streamside Management Zone
FY	Fiscal Year (July 1-June 30)	SVGBCA	Swan Valley Grizzly Bear Conservation Agreement
GNP		TMDL	Total Maximum Daily Load
ID Team	Interdisciplinary Team	USFS	United States Forest Service
FOGI	Full Old-Growth Index	USFWS	United States Fish and Wildlife Service
		WYI	Water Yield Increase

124 Permit	Stream Preservation Act Permit
318 Authorization	A Short-term Exemption from Montana's Surface Water Quality Standards
Cooperative Program	Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Program
Land Board	Board of Land Commissioners
Recovery Team	Montana Bull Trout Recovery Team

SOUTH WOOD TIMBER SALE PROJECT

LIST OF RELATED ENVIRONMENTAL REVIEWS APPENDIX A

In order to address direct, indirect, and cumulative effects on a landscape level, the analysis must incorporate past, present, and future actions within the analysis area. The following activities are located within the South Wood environmental analysis area for vegetation on Swan River State Forest. The environmental analysis areas for watershed, wildlife, soils, and fisheries are smaller in size and encompass an area specific to those disciplines.

DNRC TIMBER SALE AND ROAD PROJECTS

State timber sales where environmental analyses have been completed and sale activities have begun or have been completed:

- Small Squeezer Timber Sale (Checklist Environmental Assessment [EAC] completed in 1999)
- Woodward Creek 10 Salvage and Woodward Face 12 Salvage (EAC completed in 2000)
- Small Squeezer II Timber Sale (EAC completed in 2000)
- Center Loop Salvage (EAC completed in 1999)
- East Fen Salvage (EAC completed in 1999)
- Section 20 I and II Salvage (EAC completed in 1999)
- Section 30 Trespass (EAC completed

in 1999)

- South Point Pleasant Salvage (EAC completed in 1999)
- Woodward II Salvage (EAC completed in 1999)
- Fatwood Road Construction and Use Permit (EAC completed in 1998)
- Horse Trail Salvage (EAC completed in 1998)
- Little Hole Salvage (EAC completed in 1998)
- White Pine House Logs (EAC completed in 1998)
- Whitetail White Pine Salvage (EAC completed in 1998)
- Woodward Meadows Salvage (EAC completed in 1998)
- 15-Minute Blowdown Salvage (EAC completed in 1997)
- South Woodward Salvage (EAC completed in 1996)

State timber sale proposals with environmental reviews in progress:

- Old Whitetail Timber Sale Project Proposal, located in the Whitetail Creek drainage just north of the South Wood Timber Sale Project area.
- Napa Salvage Proposal, located approximately .5 mile south of the Soup Creek Campground.
- Goat Squeezer Timber Sale Project Proposal, located in the Goat, Squeezer, and Napa creek drainages.

All of these projects are in the initial scoping phase. General objectives have been proposed, but no specific action alternatives have been developed.

THE SWAN VALLEY GRIZZLY BEAR CONSERVATION AGREEMENT

Beginning in December 1994, DNRC participated in the development of the SVGBCA with the United States Fish and Wildlife Service (USFWS), Flathead National Forest (FNF), and Plum Creek Company Timber Company. The SVGBCA seeks to cooperatively manage grizzly bear habitat in the Swan Valley where intermingled ownership patterns and differing land-management objectives complicate habitat management for a species as wide ranging as the grizzly bear. The USFWS evaluated the SVGBCA in an environmental assessment (EA) and found that implementing the management guidelines in the agreement would not negatively impact grizzly bears (USFWS, 1995).

The South Wood Timber Sale Project area is within the conservation area delineated in the SVGBCA and complies with its guidance.

OTHER ACTIVITIES

Reciprocal access agreements with Plum Creek Timber Company that may affect resources in the South Wood Timber Sale Project area:

- South Woodward (EAC completed in 1996)
- Woodward Whitetail (EAC completed in 1997)
- Fatwood (EAC completed in 1998)
- South Wood (EAC pending)

Another activity on adjacent ownership that may affect resources within the South Wood Timber Sale Project area is ongoing logging on Plum Creek Timber Company lands.

SOUTH WOOD TIMBER SALE PROJECT

STIPULATIONS AND SPECIFICATIONS APPENDIX B

INTRODUCTION

The stipulations and specifications for Action Alternatives B, C, D, E, and F were identified or designed to prevent or reduce the potential effects to the resources considered in this analysis. In part, stipulations and specifications are a direct result of issue identification and resource concerns. This section is organized by resource.

Stipulations and specifications that apply to operations required by the contract and occurring during the contract period will be contained within the Timber Sale Contract. As such, they are binding and enforceable. Project administrators enforce stipulations and specifications for all activities relating to the project that may

occur during or after the contract period.

The following stipulations and specifications are incorporated into all action alternatives to mitigate the potential effects on resources.

WATERSHED AND FISHERIES

- Management standards of the SMZ Law (75-5-301, MCA) are implemented. SMZs will be delineated where they occur within or adjacent to harvest areas to protect areas adjacent to streams or lakes to maintain water quality. In addition, ground-based equipment is restricted to 50 feet from all wetlands and ponds, or to locations above slope breaks if they exist within 50 feet of the edge of a wetland or pond.

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- Brush will be removed from existing road prisms to allow effective road maintenance. Improved road maintenance will reduce sediment delivery.
 - Equipment leaking fluids would not be permitted to operate at stream-crossing construction sites.
 - The contractor will be responsible for the immediate cleanup of any spills (fuel, oil, dirt, etc.) that will affect water quality.
 - Culvert sizing for all road projects will be for a 50-year flood event, as recommended by a DNRC hydrologist.
 - Stream crossings where culvert removals and installations are planned will have the following requirements, as needed, to protect water-quality and meet BMPs:
 - Filter-fabric fences will be in place downstream prior to and during culvert installation.
 - Diversion channels will be constructed and lined with plastic to divert streamflow prior to any in-channel operations.
 - Planned erosion-control measures include:
 - grade breaks on roads
 - surface drainage devices on roads
 - slash-filter windrows
 - grass seeding
 - Contract requirements for bridge removal include:
 - No equipment will be allowed in the stream.
 - Excavators will be required to work each side of the bank simultaneously.
 - Any equipment operated within the high-water level of any stream or river channel shall be free of oil and fluid leaks and shall be clean of mud. Said equipment must be inspected by the Forest Officer and approved prior to use.
 - Filter-fabric sediment traps and other erosion control shall be installed prior to construction activities.
 - Seeding with Quick-Cover Mix is required at all disturbed areas the same day as installation is completed.
- Included in the project proposal are the following pertinent recommendations of the *Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program Final Report*, June 1991.
- The following numbers correspond to the numbering of recommendation items contained within the aforementioned document, included in pages 154-162 of the final report.
1. BMPs are incorporated into the project design and operations of the proposed project.
 2. Riparian indicators will be considered in the layout of the harvest units.
 3. Management standards of the SMZ are used in conjunction with the recommendations of the study.
 4. The BMP audit process will continue. This sale will likely be reviewed in an internal audit and may be randomly chosen as a Statewide audit site.
 7. SMZs will be evaluated as part of the audit process.
 12. Watershed-level planning and analysis are complete.

- Logging plans of other agencies and private companies are used.
14. DNRC is cooperating with DFWP on further study of fish habitat and populations for South Woodward and Woodward creeks.
15. DNRC will use the best available methods for logging and road building for this project.
- 16A. Existing roads are fully utilized for this proposal and brought up to BMP standards.
- 16B. DNRC utilizes BMPs, transportation planning, and logging-system design to minimize new road construction.
17. DNRC contracts with DFWP to obtain species composition, spawning inventory, and spawning habitat quality for South Woodward and Woodward creeks. DNRC's mitigation plan for roads fits all recommendations for "impaired" streams. Using "worst-case scenario" criteria provides for conservative operations in this proposal.
18. Provisions in the Timber Sale Contract address BMPs, which are rigidly enforced.
20. DNRC is planning and implementing long-term monitoring of South Woodward and Woodward creeks as well as other streams on Swan River State Forest. The monitoring is designed to document impacts of timber-harvesting and road-building activities on water quality.
- 29-34. DNRC has cooperated with DFWP to continue fisheries work. DNRC will continue to monitor fisheries on Swan River State Forest in the future as funding allows.

GRIZZLY BEARS

- All action alternatives meet the intent of the SVGBCA.
- Roads and landings will be grass seeded to revegetate with plant species less palatable to grizzly bears to discourage or minimize the potential for bear-human conflicts.
- Contractors are required to haul or store garbage in a safe place so bears will not be attracted to the area.
- No logging camps are allowed within the sale area.
- The Forest Officer will immediately suspend activities directly related to the proposed action to prevent imminent harmful confrontation or conflict between grizzly bears and humans, or other threatened or endangered species and humans.
- Contractors will be prohibited from carrying firearms onto closed roads while working under contract.
- When possible, healthy trees that are not big enough to be harvested will be retained for screening.

WOLVES

Contract provisions will protect any wolf den or rendezvous site within the gross sale area that may be discovered during implementation of this proposal.

BIG GAME

- The purchaser is authorized to enter the project area with motorized vehicles only for purposes related to the performance of the contract. Road use is restricted to nonmotorized transportation beyond any road closure for any other purpose. Motorized vehicle entry for purposes other than contract

performance, such as hunting or transporting game animals, will be considered in trespass and prosecuted to the fullest extent of the law (ARM 45-6-203).

- When possible, healthy trees not big enough to be harvested will be retained for screening.

WILDLIFE TREES AND SNAG RETENTION AND RECRUITMENT

- Snag retention is implemented as recommended under the SFLMP's Biodiversity Guidance.
- High-quality wildlife trees/snags, such as large, broken-topped western larch, will be retained and given special consideration during yarding operations to prevent loss.

VISUALS

- Damaged residual vegetation will be slashed.
- The size and number of landings will be limited; the location will be away from main roads, when possible.
- Disturbed sites along road right-of-ways will be grass seeded.
- When possible, healthy trees not big enough to be harvested will be retained.

CULTURAL RESOURCES

- A contract clause provides for suspending operations if cultural resources are discovered; operations may only resume when directed to do so by the Forest Officer.
- A DNRC archaeologist conducted a review of the project.

SOILS

COMPACTION

- Logging equipment will not operate off forest roads unless soil moisture at 6 inches is less than 20 percent, is frozen to a depth of at least 4 inches, or is snow covered to a minimum depth of 18 inches. These conditions usually prevent soil compaction, rutting, or displacement.
- Existing skid trails and landings will be used when their design is consistent with prescribed treatments and they meet current BMP guidelines.
- To reduce the number of skid trails and the potential for erosion, designated skid trails are required when moist soils or short steep pitches (less than 300 feet) are not accessed by other logging systems.

- The logging foreman and sale administrator will agree to a skidding plan prior to operating equipment.
- The density of skid trails in a harvest area will not exceed 20 percent of the total area in a cutting unit.

SOIL DISPLACEMENT

- Conventional ground-based skidding equipment will not be operated on slopes steeper than 40 percent. Soft-tracked yarding has less impact than conventional tractor skidding on slopes up to 55 percent. Cable yarding would be used on the steeper slopes.
- Slash piling and scarification would be completed with a dozer where slopes are gentle (less than 35 percent). Slash treatment and site preparation would be done with an excavator in areas where soils are wet and slopes are steeper, up to 55 percent.

EROSION

- Ground-skidding machinery will be equipped with a winchline to limit equipment operations in wet areas or on steep slopes.
- Roads used by the purchaser will be reshaped and the ditches redefined following use to reduce surface erosion.
- Drain dips and gravel will be installed on roads as needed to improve road drainage and reduce maintenance and erosion.
- Some road portions will be repaired and upgraded to standards that reduce erosion potential and maintenance needs.
- The prompt and timely application of certified weed-free grass seed and fertilizer would be applied to all newly constructed road surfaces and cut-and-fill slopes, as well as any existing disturbed cut-and-fill slopes and landings immediately adjacent to open roads. This would be done to stabilize soils and reduce or prevent the establishment of noxious weeds and would include:
 - seeding all road cuts and fills concurrently with construction,
 - applying a "quick cover" seed mix at culvert installation sites within 1 day of work completion, and
 - seeding all road surfaces and reseeding culvert installation sites when the final blading is completed for each specified road segment.
- As directed by the Forest Officer, water bars, logging-slash barriers, and temporary culverts will be installed on skid trails where, based on ground and weather conditions, erosion is anticipated. These erosion-control features will be maintained and periodically

inspected throughout the contract period or extensions thereof.

AIR QUALITY

- To prevent individual or cumulative effects during burning operations, burning will be done in compliance with the Montana Airshed Group reporting regulations and any burning restrictions imposed in Airshed 2. This will provide for burning during acceptable ventilation and dispersion conditions.
- To reduce effects from burning operations:
 - Dozer, excavator, landing, and roadwork debris will be piled clean of dirt and duff so that piles will burn hotter and with less smoke.
 - Burning would be done in the spring or fall when ventilation is good.
 - The Forest Officer may require that piles be covered due to the higher relative humidity during spring and fall. Covered piles are drier, ignite easier, burn hotter, and extinguish sooner. This will reduce dispersed (unentrained) smoke.
 - The number of piles to burn would be reduced by leaving large woody debris in the harvest units.

NOXIOUS WEED MANAGEMENT

To further limit the possibilities of spreading weeds, the following integrated weed-management mitigation measures of prevention and control will be implemented:

- All tracked and wheeled equipment are required to be clean of noxious weeds prior to beginning project operations. The contract administrator will inspect

equipment periodically during project implementation.

- The prompt revegetation of disturbed roadside sites will be required. Roads used and closed as part of this proposal will be reshaped and seeded.
- Surface blading may be required to remove weeds before the seed-set stage on roads affected by the proposal.
- Herbicide application, as designated by the Forest Officer, may be used to control weeds along roads that access the timber sale area.

HERBICIDES

To reduce risks to aquatic and terrestrial resources, the following will be required:

- All herbicides will be applied by licensed applicators in accordance with laws, rules, and regulations of the State of Montana and Lake County Weed District.
- All applications will adhere to BMPs and the herbicide's specific label guidelines.
- Herbicide applications will not be general, but site specific to areas along roads where noxious weeds are occurring. All no-spray areas will be designated on the ground before applications begin.
- Herbicides will not be applied to areas where relief may contribute runoff directly into surface water.
- Herbicides will be applied on calm, rainless days to limit drift and the possibility of the herbicide moving off the road prisms.

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VEGETATION ANALYSIS APPENDIX C

INTRODUCTION

This section provides a detailed description of the present conditions of the forest and addresses the potential effects of the proposed alternatives related to the following issues:

- timber cover types, the distribution of age classes, canopy coverage, fragmentation, and species composition of the forest on the landscape;
- insect, disease, and wildfire effects in regard to risks and losses at the project level;
- old-growth amounts and how it was defined;
- a sensitive plant survey and the effects of the proposal on sensitive plants; and
- noxious-weed control.

LANDSCAPE ANALYSIS

BACKGROUND

The SFLMP directs DNRC to take a coarse-filter approach to biodiversity by favoring an appropriate mix of stand structures and compositions on State land (DNRC 1996). To implement a coarse-filter approach and meet the SFLMP directives, landscape analysis techniques were used to determine an appropriate mix of stand structures and compositions, including forest cover-type representation, age-class distribution, and structural characteristics.

Analysis Methods

The analysis compares the current stand conditions with the changes caused by the proposed alternatives.

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Inventory data from the 1930s was used in Losensky's 1993 data to estimate the proportions of various stand-structural stages by cover type as they were historically represented throughout the Inland Northwest. This provides an estimate of the

natural characteristics of forests prior to fire suppression and extensive logging. Losensky (1997) worked with DNRC to complete an analysis for the entire State. Some vegetation types specific to that work are included in this analysis.

The protocol used to assign cover types using the Swan River State Forest SLI is explained in detail in the *SFLMP Biodiversity Guidance* (May 1998). Database crosstabs and tables that were used in the analysis are in the project file. The SFLMP Biodiversity Guidance and databases are available at the Swan River State Forest office.

Analysis Area

The vegetation analysis includes 3 geographic scales:

- Upper Flathead - Historic conditions refer to those from Climatic Section 333C of the Upper Flathead (Losensky 1997).
- Swan River State Forest management block - Current conditions are analyzed on the scale of the entire Swan River State Forest, based on the Swan River State Forest SLI database file.
- Project level - Within the project area, the stands proposed for harvest entry are analyzed by harvest unit for each alternative.

Analyses use both the Swan River State Forest management block and the project-level analysis areas throughout.

The SLI database is updated on an annual basis to include information corrections on a stand-level basis or to cover scheduled changes where harvesting activities have taken place. This update process provides DNRC foresters with the best available data for the required analysis on proposed management activities. Where ongoing and future timber sales have not yet received a

postharvest inventory, probable effects are taken into consideration to address cumulative impacts in each analysis area. The display of effects shows the trends in cover-type conversions and age-class distributions.

Within the analysis area, 2 other timber sales have been completed or are taking place concurrently with the analysis of this sale. The estimated effects of this project on cover types, age-class distributions, and old growth will be considered with Small Squeezer and Small Squeezer II timber sales in a cumulative-effects analysis for Swan River State Forest. Many salvage operations have taken place over several years; these have not changed stand composition, age class, or structure, but have slightly altered the stand density.

EXISTING VEGETATION

The existing vegetative types on Swan River State Forest and within the project area are a result of various site factors, fire regimes, and past management practices.

SITE FACTORS

Site conditions vary depending on their geographic, physiographic, and climatic factors. These conditions include features such as:

- soil types,
- aspect (sites proposed for harvesting have a southeasterly to northeasterly exposure),
- position on the landscape (the South Wood Timber Sale Project area is mostly on the lower slopes of the Mission Range),
- growing seasons, and
- moisture availability.

These variables were combined to develop the habitat-type classifications used to describe

successional development and timber productivity, among other things (Pfister et al., 1977).

Within the South Wood Timber Sale Project area, more than 95 percent of the habitat types are in the warm to moist climatic regimes, which include mostly grand fir and western red cedar habitat types. The remaining 5 percent are in the cool and moist climatic regimes, which include the subalpine fir and Engelmann spruce habitat types.

Forest productivity on these sites is rated moderate to high. The sites are predominantly occupied with grand fir, Douglas-fir, western larch, lodgepole pine, and western white pine, with scattered representations of ponderosa pine, western hemlock, and western red cedar.

FIRE REGIMES

Habitat types have also been grouped to indicate the severity and frequency of wildfires that historically may have occurred on a site (Fischer and Bradley, 1987). The proposed harvest units are in Fire Group 11. Stand-replacing fires have been estimated to occur once every 50 to 200 years on the proposed harvest sites. Less severe fires likely occurred more often and, in broad locations, would have helped maintain seral and western larch relict stands. These are stands with large trees that have survived fires of lower intensity.

Recorded fire history in the project area includes:

- Large portions of the areas proposed for harvesting were burned by a stand-replacing fire in the 1890s, which regenerated most of the larch and lodgepole pine stands that are proposed for commercial thinning. Many of the stands labeled as old growth by the SLI were also influenced by

this fire, but probably only experienced low to moderate burn intensities, which are exhibited by the presence of the relict survivor trees that are mixed with mature overstory, approximately 100 to 110 years old. Other old-growth stands were only slightly affected or unaffected by the large fire, as evidenced by the full development of old overstory with climax understory. These stands are mostly on northeasterly aspects or in cool moist canyons.

- Since the 1930s, fire suppression has also affected the stand structures in Swan River State Forest. This unmeasured effect is caused by suppressing lightning-caused fires that, prior to modern intervention, would have been influenced only by weather and climatic factors. These un suppressed fires may have resulted in stand-replacing events when wind, drought, and high temperatures combined to form high-intensity burning conditions. Such conditions occur during summer drought periods in western Montana.

PAST MANAGEMENT ACTIVITIES

Past inventory records display that timber harvesting has been ongoing in the project area since the early 1960s.

Timber sales in the South Wood Timber Sale Project area between 1960 and 2000:

- Most of the harvesting in Swan River State Forest occurred in the flatter areas west of Swan River at the base of the Mission Range, where regeneration harvests were conducted on 20-acre harvest units in the 1960s. The majority of the sale units have regenerated and are well stocked with a variety of sapling-/pole-sized tree species. Seedtree and clearcut harvesting between 1970 and 1992 have created

10- to 150-acre openings that have densely regenerated with 6- to 40-foot trees. Since the 1960s, ongoing salvage harvesting has taken place throughout the areas of low elevation.

- Stands on the lower slopes of Section 23 were harvested with a clearcut/seedtree prescription in the 1960s when the section was owned by the USFS. These stands have regenerated to a variety of species that include western larch, Douglas-fir, western red cedar, western white pine, and grand fir. The regeneration is 15 to 30 feet tall and well-stocked to overstocked in most stands.
- Plum Creek Timber Company timber harvesting in adjacent Sections 3, 9, 11, 13, 15, 21, 25, 27, and 29 T23N, R18W, is ongoing; most stands, with the exception of hiding cover retained for the SVGBCA, are scheduled for selective harvesting in the next few years. Clearcut, seedtree, and selective harvest methods have typically been applied to hundreds of contiguous acres, creating abrupt straight edges that follow section-line ownership boundaries.

COVER-TYPE REPRESENTATIONS FOR THE ANALYSIS AREA

LANDSCAPE LEVEL (COARSE FILTER)

FIGURE C-1 illustrates the percentage of forested ground occupied by a particular cover type. The comparisons shown include the Upper Flathead Climatic Section historic data and the current and appropriate conditions on the scale of Swan River State Forest.

Data indicates that mixed-conifer stands are currently overrepresented in reference to conditions that DNRC has identified as appropriate by using historic data at the climatic section level, and is adjusted for Swan River State Forest conditions

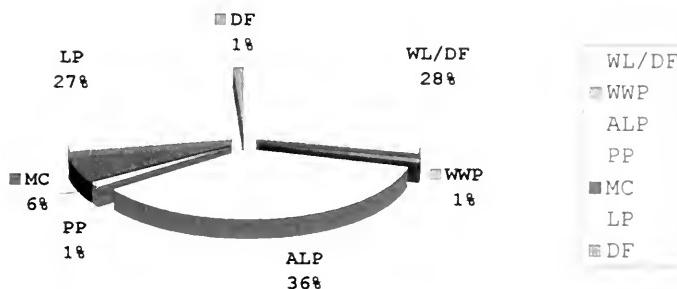
by analysis of the SLI. Many species that make up the mixed-conifer cover type are shade tolerant and increase in the species component of stands as the interval is lengthened between disturbances, such as wildfire. Subalpine fir, lodgepole pine, and ponderosa pine cover types are also slightly overrepresented.

The western larch/Douglas-fir and western white pine cover types are currently underrepresented on Swan River State Forest in reference to desired, or appropriate, cover types, but for different reasons. Western larch is not shade tolerant, and Douglas-fir is less shade tolerant than true firs that are encroaching to make up the mixed-conifer cover type as stands trend toward climax conditions. Douglas-fir and western larch have historically been perpetuated through fairly intensive disturbances such as wildfires, and, when mature, these species are more resistant to fire mortality than others. Lack of moderate-intensity and stand-replacing fires since the advent of fire suppression, along with the normal temporal and spatial variation in fire occurrence, have combined to increase the development of mixed-conifer stands within the Douglas-fir/western larch cover type.

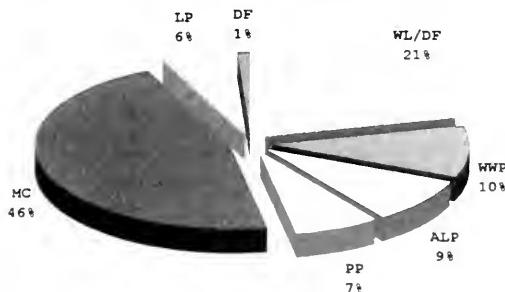
Western white pine has been disappearing as a component of the species mix where it historically occurred. White pine blister rust infections have drastically affected western white pine. The number of healthy western white pine that occupy the canopy as overstory dominants has been on the decline since the 1930s across most of the Pacific Northwest. The South Wood Timber Sale Project area is no exception. Loss of both overstory and regenerated western white pine has led to the classification of historic western white pine cover types as mixed conifer. Western white pine can be restored by planting rust-resistant seedlings,

FIGURE C-1

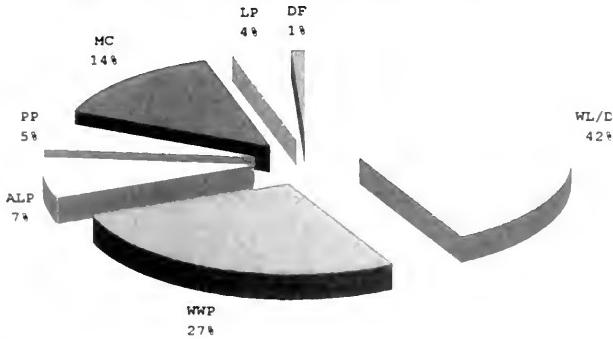
COVERTYPE PERCENT OF
HISTORIC UPPER FLATHEAD VALLEY



CURRENT COVERTYPE PERCENT OF THE
SWAN RIVER STATE FOREST ANALYSIS AREA



APPROPRIATE COVERTYPE PERCENT OF THE
SWAN RIVER STATE FOREST ANALYSIS AREA



but openings in the canopy are required for successful establishment.

AGE CLASS

AGE-CLASS DISTRIBUTION ON SWAN RIVER STATE FOREST (LANDSCAPE-LEVEL COARSE FILTER)

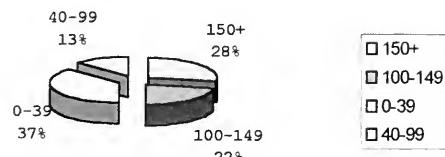
Age-class distributions are another important characteristic for determining the average historical or appropriate conditions. When age-class distributions are combined with information on cover types, a fairly clear picture emerges over time of the average forest conditions. Knowledge of local topographical effects, ecological characteristics of tree species, climatic vegetation relationships, and disturbance regimes helps to define appropriate conditions. Inventories of the 1930s quantified the ages of the forest stands. To arrive at age estimates, Losensky examined the data and projected the stands back to the early 1900s. This data is useful in setting baseline conditions for determining the extent that current forest age-class distribution deviates from historical conditions.

FIGURE C-2 compares the current condition of age classes on Swan River State Forest with the historical conditions from Upper Flathead Valley.

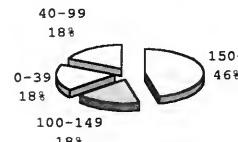
Comparing the entire Swan River State Forest with historical data from the Upper Flathead Valley shows that Swan River State Forest is lower in stands of the seedling/sapling age class and higher in stands that are in the 150-year-and-older age class, relative to historic conditions. This can be explained by the lack of large-scale stand-replacing fires on Swan River State Forest over the past 90 years and the limited logging entries that replaced old growth with seedling/

FIGURE C-2

PERCENT OF AREA IN EACH AGE CLASS FROM HISTORIC UPPER FLATHEAD DATA



PERCENT OF ACRES IN EACH AGE CLASS FOR SWAN RIVER STATE FOREST



sapling-sized stands (0 to 39 years old).

DIRECT EFFECTS TO COVER TYPES AND AGE CLASS

• *Direct Effect Of No-Action Alternative A*

The western larch/Douglas-fir and western white pine cover types would continue to be underrepresented unless a large disturbance, such as a wildfire, occurs. Shade-tolerant trees would continue to regenerate under closed-canopy forests.

No immediate change from the existing environmental condition is expected in regard to age-class distribution, unless a large disturbance, such as a wildfire, occurs.

• Direct Effects of All Action Alternatives

Depending on the alternative implemented, mixed-conifer and other cover types would change following harvesting, site preparation, and tree-planting activities. This would be done by thinning to remove shade-tolerant species (alpine fir, grand fir, western red cedar) or lodgepole pine, or by replanting seedtree-harvested areas to the desired cover-type species (western larch/Douglas-fir or western white pine). The western white pine and western larch/Douglas-fir cover types would increase following these activities, dependent on the implemented alternative.

TABLE C-1 - DIRECT EFFECTS TO COVER-TYPE ACREAGES BY ALTERNATIVE shows the number of acres to be treated with each prescription and the resulting change in cover types for each action alternative.

Seedtree harvesting would change stands from their existing age class to the 0-to-39-year age class. Commercial thinning would not change age classes because stands planned for thinning are essentially even-aged.

TABLE C-2 - DIRECT EFFECTS TO AGE CLASSES BY ALTERNATIVE shows the number of acres to be treated with each prescription and the resulting change in age class for each action alternative.

INDIRECT EFFECTS TO COVER TYPES AND AGE CLASSES

• Indirect Effects of No Action Alternative I

Over time, natural forest succession and fire suppression would reduce the variability of age classes and cover types on the landscape as the stands age.

• Indirect Effects to Canopy Coverage of Action Alternatives B, C, D, E, and F

The residual-tree canopy cover varies by alternative and the prescription applied. The canopy cover affects the tree growth of residual trees, as well as the success and species of regeneration or understory growth. The residual canopy cover is all tree canopies in seedtree harvests, including clumps of cedar for stand diversity and submerchantable trees. Canopy cover would increase in areas of seedtree harvests as regeneration replaces the cut trees. Ten to 15 years would be needed to develop up to 70 percent canopy cover in 10- to 15-foot tall trees. In commercially thinned areas, canopy cover would increase over time (the increase is estimated at 10 to 15 percent in 10 years) as canopy size and density increases in the thinned residual trees (crown ratio increases due to light and water availability).

• Indirect Effects of Action Alternative B

Action Alternative B applies a seedtree harvest prescription to all stands proposed for harvesting. This prescription emulates a stand-replacement fire in that the largest share of the trees would be killed and some fire effects would be applied when slash is piled and burned. Regeneration would be mostly western larch, Douglas-fir, and western white pine, which is similar to what would be expected following a fire. Patchy residual grand fir, subalpine fir, western hemlock, and western red cedar would also be a component in stands within this fire type. Snags left in the harvest units would represent only a small portion of the snags that would be left by a fire. Most of the snags would not be burned except by coincidence. The seedtrees would

TABLE C-1 - DIRECT EFFECTS TO COVER TYPE ACREAGES BY ALTERNATIVE

ACRES HARVESTED IN COVER TYPES
AND THE RESULTING CHANGE IN COVER TYPES

COVER TYPE	ACRES HARVESTED IN COVER TYPES						ALTERNATIVE F ACRES CHANGE
	ALTERNATIVE B ACRES CHANGE	ALTERNATIVE C ACRES CHANGE	ALTERNATIVE D ACRES CHANGE	ALTERNATIVE E ACRES CHANGE	ALTERNATIVE E ACRES CHANGE	ALTERNATIVE E ACRES CHANGE	
Subalpine fir	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Douglas-fir	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Hardwoods	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Lodgepole pine							
	-98	Thin to WL/ DF Add from MC	-98	Thin to WL/ DF Add from MC	-66	Thin to WL/ DF Add from MC	.98
	-0-	+89	Thin, but stays LPP	+89	Thin, but stays LPP	+33	+89 Add from MC
		108		108	7	78	Thin, stays LPP
Ponderosa pine	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Mixed conifer	-80	Regenerate to WWP	-282	Thin to WL/ DF Thin to LPP	-371	Thin to WL/ DF Thin to LPP	-278
	65	Regenerate to MC	-89	-89	-33	-33 Thin to LPP	-197 Thin to WL/ DF
		-18	Thin to WWP		-18	Thin to WWP	11 Regen to MC
Western larch/ Douglas-fir	0	Regenerate from MC	+282	Add from MC	+371	Add from MC	+278 Add from MC
		+98	Add from LPP	+98	Add from LPP	+66 Add from LPP	+197 Add from MC
						+60 Add from SAF	+98 Add from LPP
Western white pine	168	Regenerate, but stays WWP	+18	Add from MC		+18 Add from MC	+18 Add from MC
	+80	Regenerate from mixed conifer	32	Thin, but stays WWP	-0-	72	21 Thin, stays WWP

DF - Douglas-fir LPP - Lodgepole pine PP - Ponderosa pine
 MC - Mixed conifer WL - Western larch WW - Western white pine
 SAF - Subalpine fir SAW - Subalpine fir

TABLE C-2 - DIRECT EFFECTS TO AGE CLASSES BY ALTERNATIVE

ALTERNATIVE	AGE CLASS			
	0 TO 39 YEARS OLD	40 TO 99 YEARS OLD	100 TO 149 YEARS OLD *	150 YEARS PLUS
B	Acres	+313	-0-	-111
	Change	Reproduction area		Regeneration harvest
C	Acres	-0-	-0-	-0-
	Change			
D	Acres	-0-	-0-	-0-
	Change			
E	Acres	+93	-0-	-22
	Change	Reproduction area		Regeneration harvest
F	Acres	+29	-0-	-11
	Change	Reproduction area		Regeneration harvest

* Lodgepole pine is 100 to 139 years old

be larger, fire-tolerant larch and Douglas-fir that tend to resist burning.

The proposed seedtree with group retention prescription would be applied over 313 acres. The acres would receive mechanical site preparation and have minimal overstory competition for the seral species that would regenerate naturally and through planting. The open conditions would help the regeneration become established and outcompete brush and other shade-tolerant tree species.

Across the project area, the forest would contain a mosaic of structures to include single-storied, two-storied, and multistoried conditions. This structure would be typical of mixed-severity fires where portions of the fire area may be stand replacing. The harvest areas would emulate areas where fires tend to burn hot, open up the site for establishing new regeneration and creating single-storied stands. Fires also tend

to pass through some areas causing very little mortality, especially in areas containing the thicker-barked western larch, Douglas-fir, and ponderosa pine species.

The scale or sizes of the harvest units, as a whole, is typical of fire in Fire Group 11 (Fisher and Bradley, 1987). Harvest units range in size from 3 to 40 acres, averaging 25 acres.

The patterns planned for groups of retention trees would be typical of postwildfire conditions. Due to the existing forest conditions, more western red cedar would be retained within these group-retention areas than would be expected under naturally occurring conditions.

• Indirect Effects of Action Alternative C

Action Alternative C applies a commercial-thin harvest prescription to all stands proposed for harvesting. This prescription emulates the effects of low-intensity fires with flare-ups common in the mixed-severity

fire regime. Following harvesting and the retention of an average of 100 trees per acre, the canopy closure would range between 25 and 60 percent, with openings of 1 to 2 acres common where climax tree species predominate. Typical low-intensity fires may retain this level of overstory trees; the species retained would likely be the thicker-barked western larch and Douglas-fir. In openings, regeneration would mostly be western larch, Douglas-fir, lodgepole pine, and a representation of western white pine. Grand fir, subalpine fir, western hemlock, and western red cedar would also regenerate in the shaded areas of these fire types.

This alternative includes both mature stands and some old stands greater than 150 years old. The older stands would have larger, older trees retained compared to those stands in the younger age classes. Mature stands comprise 495 acres in this prescription, and old stands comprise 134 acres.

The thinning prescription calls for most areas to have heavy overstory retention. Due mainly to overstory competition, most of the area would not have suitable conditions for regenerating seral tree species. Site conditions would favor the regeneration of shade-tolerant species. In the future, the stands would experience increased diameter growth in the remaining trees due to reduced crown and moisture competition.

Following the establishment of regeneration, the structure in harvest units would be 2-storied, which would be typical of low-severity fires. These stands would be available for future regeneration harvests, or could be considered for old-growth recruitment in the future as tree sizes and ages increase.

The scale or size of the harvest

units would be larger than is typical of low-intensity fires in the mixed-severity regime, and the harvest units would not emulate stand-replacement events.

• *Indirect Effects of Action Alternative D*

Action Alternative D applies a commercial-thin harvest prescription to all stands proposed for harvesting. This prescription emulates the effects of low-intensity fires with flareups common in the mixed-severity fire regime. Following harvesting and the retention of approximately 100 trees per acre, the canopy closure would range between 25 and 60 percent, with openings of 1 to 2 acres common where climax tree species predominate. Typical low-intensity fires may retain this level of overstory trees; the species retained would likely be the thicker-barked western larch and Douglas-fir. In openings, most regeneration would be western larch, Douglas-fir, lodgepole pine, and a representation of western white pine. Grand fir, subalpine fir, western hemlock, and western red cedar would also regenerate in the shaded areas of these fire types.

This alternative comprises only mature stands less than 150 years old. This treatment would be applied on 667 acres.

The thinning prescription calls for most areas to have heavy overstory retention. Due mainly to overstory competition, most of the area would not have suitable conditions for regenerating seral tree species. Site conditions would favor the regeneration of shade-tolerant species. In the future, the stands would experience increased diameter growth in the remaining trees due to reduced crown and moisture competition.

Following the establishment of regeneration, the structure in harvest units would be 2-storyed, which would be typical of low-severity fires. These stands would be available for future regeneration harvests or could be considered for old-growth recruitment in the future as tree sizes and ages increase.

The scale or size of the harvest units would be larger than is typical of low-intensity fires in the mixed-severity regime, and the harvest units would not emulate stand-replacement events.

- Indirect Effects of Action Alternative E***

Action Alternative E applies a combination of commercial-thin and seedtree harvest prescriptions to the stands proposed for harvesting. For those areas of commercially thin, the effects would be similar to those for Action Alternative D. A total of 477 acres would be treated using the commercial-thin prescription. In those areas where seedtree harvests would be applied, the effects would be similar to Action Alternative B. A total of 93 acres would be treated with seedtree prescriptions.

Using both prescriptions, Action Alternative E would emulate a mixed-severity fire regime, which is a combination of stand-replacing fires and lower-intensity burns.

- Indirect Effects of Action Alternative F***

Action Alternative F applies a combination of commercial-thin and seedtree harvest prescriptions to the stands proposed for harvesting. For those areas of commercially thin, the effects would be similar to those for Action Alternative D. A total of 484 acres would be treated using commercial-thin prescriptions. For those areas where seedtree harvests would be applied, the effects would be similar to Action Alternative B. A total of 30 acres would be treated with the seedtree prescription.

Using both prescriptions, Action Alternative F would emulate a mixed-severity fire regime where there is a combination of stand-replacing fires and lower-intensity burns. Together with previous harvests and Plum Creek Timber Company activities, this prescription distributes the fire emulation randomly across the landscape.

TABLE C-3 - INDIRECT EFFECTS TO CANOPY COVERAGE BY ALTERNATIVE shows canopy coverage percent by acres before harvesting and following harvesting for each alternative.

TABLE C-3 - INDIRECT EFFECTS TO CANOPY COVERAGE BY ALTERNATIVE

ALTERNATIVE	BEFORE HARVEST	ACRES IN CANOPY COVERAGE RANGE AFTER HARVEST			
	NO ACTION 70+ PERCENT	SEEDTREE 10 TO 25 PERCENT	THINNING 25 TO 35 PERCENT	THINNING 35 TO 50 PERCENT	
B	313	313	-0-	-0-	-0-
C	629	-0-	228	366	35
D	667	-0-	189	475	3
E	570	93	-0-	445	32
F	514	30	126	355	3

**CUMULATIVE EFFECTS TO COVER TYPES
AND AGE CLASSES**

Cumulative Effects to Cover Types

The cumulative effects of Small Squeezer and Small Squeezer II timber sales have increased the amount of the western larch/Douglas-fir cover type on Swan River State Forest. This was done by removing climax tree species from mixed-conifer cover types. Proposed Action Alternatives C, D, E, and F would further increase the amount of the western larch/Douglas-fir cover type by favoring Douglas-fir and western larch to leave where commercial-thin treatments would be

used. Action Alternatives B, E, and F would favor the western white pine cover type, using natural regeneration and blister-rust-resistant western white pine planting where seedtree harvests are used. Treatments favoring seral cover types would result in a corresponding reduction of the area across the forest in the mixed-conifer and subalpine fir cover types. TABLE C-4 - CUMULATIVE EFFECTS TO COVER TYPE ACREAGES BY ALTERNATIVE gives the anticipated cumulative effects of Small Squeezer and Small Squeezer II timber sales together with each proposed alternative using the Swan River State Forest SLI database for

TABLE C-4 CUMULATIVE EFFECTS TO COVER TYPE BY ALTERNATIVE

COVER TYPE	ACRES AS ASSESSED BY SWAN RIVER STATE FOREST SLI DATABASE	CUMULATIVE ACRES ASSESSED WITH SMALL SQUEEZER AND SMALL SQUEEZER II TIMBER SALES ALSO REPRESENTS NO-ACTION ALTERNATIVE CUMULATIVE ACRES (NET CHANGE IN ACRES)	CUMULATIVE AREA IN ACRES AS ASSESSED WITH EACH ALTERNATIVE				
			CUMULATIVE ACRES (NET CHANGE IN ACRES)				
			B	C	D	E	F
Subalpine fir	3,451	3,451 (0)	3,451 (0)	3,451 (0)	3,451 (0)	3,391 (-60)	3,451 (0)
Douglas-fir	480	480 (0)	480 (0)	480 (0)	480 (0)	480 (0)	480 (0)
Hardwoods	21	21 (0)	21 (0)	21 (0)	21 (0)	21 (0)	21 (0)
Lodgepole pine	2,316	2,196 (-120)	2,196 (0)	2,187 (-9)	2,187 (-9)	2,163 (-33)	2,187 (-9)
Ponderosa pine	2,403	2,403 (0)	2,403 (0)	2,403 (0)	2,403 (0)	2,403 (0)	2,403 (0)
Mixed conifer	17,368	17,311 (-57)	17,231 (-80)	16,992 (-389)	16,851 (-460)	16,982 (-329)	17,007 (-304)
Western larch/ Douglas-fir	7,750	7,927 (+177)	7,927 (0)	8,209 (+380)	8,396 (+469)	8,330 (+404)	8,222 (+295)
Western white pine	3,772	3,772 (0)	3,852 (+80)	3,790 (+18)	3,772 (0)	3,790 (+18)	3,790 (+18)

baseline data. The table shows total acres remaining in each cover type with each alternative's treatments and the net acres that would change cover-type classification due to a treatment. Individual changes in acres by cover type are shown in TABLE C-1 - DIRECT EFFECTS TO COVER-TYPE ACREAGES BY ALTERNATIVE.

Cumulative Effects to Age Classes

Natural stand development, past timber sales, and wildfires have created the current age-class representations in this area. Future sales would likely continue to be planned with the potential to modify age-class distribution within stands. Any changes in age classes would be reevaluated during scheduled SLI updates.

The tables reflect data from the Swan River State Forest SLI database that was updated in March 2000. Some ongoing timber sales are not included in this database; therefore, cumulative effects from Small Squeezers and Small Squeezers II timber sales will be added in this section. The effect to age class and the acreage effects are taken from several sources, including the appropriate EAs/EISs, timber sale contracts, and visual reviews of the harvested areas. TABLE C-5 - CUMULATIVE EFFECTS TO AGE CLASSES BY ALTERNATIVE compares cumulative effects by alternative against the baseline Swan River State Forest data.

Plum Creek Timber Company is managing their lands with various harvest practices. A higher percentage of acres in younger age classes of seral species are replacing the older stands that have occupied these sites in the past; this is expected to continue. The average age of forest stands would decrease in the general vicinity of the project area.

FRAGMENTATION

Existing Condition/Effects of No-Action Alternative 1

Historically, forest fires burning with various frequencies and intensities created the patterns and edges associated with forest patch size and shape. This resulted in a patchwork of various age classes of forests and a variety of sizes and shapes of forest stands. Since the advent of fire suppression and logging activities, the primary agent of patch development has been forest management and human developments. Intense fires during severe seasons still influence patch development, but the frequency of low-intensity fires and ignition sources for large fires is greatly reduced.

Swan River State Forest and adjoining properties display this pattern of fire-generated patches overlain by human-generated logging-unit and land-clearing patches. Past logging units often were designed in regular geometric patterns, usually ranging from 20 to 100 acres, and, when viewed from above, created an unnatural-looking mosaic across the landscape. The shapes of these units are more regular and edge lengths are probably lower than the fire-generated patches. These past harvest units have been characterized as an unnatural "fragmentation" of the normal forest condition; however, the natural stand boundaries show that the past landscape was highly variable and fragmented by fire and other influences. More recent harvests on neighboring ownerships have followed property boundaries, making a checkerboard pattern of 300- to 640-acre harvest patches. Past harvest openings have utilized both even-aged regeneration harvesting (seedtree and clearcutting) and uneven-aged harvesting (individual tree selection and group selection).

TABLE C-5 CUMULATIVE EFFECTS TO AGE CLASSES BY ALTERNATIVE

ALTERNATIVE	CUMULATIVE ACRES IN SWAN RIVER STATE FOREST BY AGE CLASS (PERCENT OF ACRES IN SWAN RIVER STATE FOREST) [CHANGE IN ACRES]			
	0 TO 39 YEARS OLD	40 TO 99 YEARS OLD	100 TO 149 YEARS OLD *	150 YEARS +
Area as assessed by Swan River State Forest SLI database	6,735 (17.9%)	6,678 (17.8%)	6,793 (18.1%)	17,332 (46.2%)
Cumulative area with additional projects assessed (also represents No-Action Alternative A)	6,875 (18.3%) [+140]	6,610 (17.6%) [-68]	6,721 (17.9%) [-72]	17,332 (46.2%) [0]
Cumulative area in acres as assessed with Action Alternative B	7,188 (19.1%) [+313]	6,610 (17.6%) [0]	6,610 (17.6%) [-111]	17,130 (45.6%) [-202]
Cumulative area in acres as assessed with Action Alternative C	6,875 (18.3%) [0]	6,610 (17.6%) [0]	6,721 (17.9%) [0]	17,332 (46.2%) [0]
Cumulative area in acres as assessed with Action Alternative D	6,875 (18.3%) [0]	6,610 (17.6%) [0]	6,721 (17.9%) [0]	17,332 (46.2%) [0]
Cumulative area in acres as assessed with Action Alternative E	6,968 (18.6%) [+93]	6,610 (17.6%) [0]	6,699 (17.8%) [-22]	17,261 (46.0%) [-71]
Cumulative area in acres as assessed with Action Alternative F	6,904 (18.4%) [+29]	6,610 (17.6%) [0]	6,710 (17.6%) [-11]	17,314 (46.1%) [-18]

* Lodgepole pine is 100 to 139 years old

The Swan River State Forest SLI database shows that timber stands are delineated along natural and human-generated boundaries. The natural boundaries fall along edges of moisture regimes, age classes, soil types, topographic features, and fire influences that created visible differences in timber stand characteristics. The human-generated boundaries follow property boundaries, natural boundaries, and past harvest areas. The stand size is variable, depending on location, and ranges from 5 to several hundred acres. In the project area, stand sizes reflect both past harvesting and large fires that burned in the 1890s. As shown in the age-class discussion, Swan River State Forest is low in younger age classes compared to historic conditions.

DIRECT EFFECTS TO FRAGMENTATION

Direct Effects of Action Alternatives B, C, D, E, and F

Where seedtree harvesting is proposed, the harvest units mainly follow stand boundaries delineated in the SLI database. The primary effect would be to create new, younger-aged patches of the existing stand size with irregular boundaries. Residual patches of western red cedar and reserve trees would provide patchy variability within the units.

Where commercial thinning is proposed, the patch sizes, ages, or shapes would not change, except where lodgepole pine stands or climax species concentrations would be cut, which would create 1- to 3-acre openings. The openings would

be similar to flare-up areas in low-intensity fires.

INDIRECT EFFECTS TO FRAGMENTATION

Indirect Effects of Action Alternatives B, C, D, E, and F

Some seedtree harvest units are adjacent to past harvest areas and other proposed harvest units, resulting in an enlargement of the younger age-class patches and a blending of the geometrical shapes of the old units.

Where commercial thinning is proposed, harvesting some units would tend to reduce the differences between adjacent stands and actually increase the patch size across similar stands.

CUMULATIVE EFFECTS TO FRAGMENTATION

Cumulative Effects of Action Alternatives B, C, D, E, and F

Where seedtree units are proposed, there would be an overall increase in younger age-class patches and a decrease in older age classes, moving the forest towards historic conditions. See the age-class discussion for acres that would change by alternative.

INSECT, DISEASE, AND WILDFIRE EFFECTS

BACKGROUND

Identifying active pathological agents are an inherent part of designing project-level timber sales. Some forest conditions are predisposed to some level of disturbance, whether from insects, diseases, winds, or wildfires.

Identifying these conditions or trends and developing management strategies to reduce environmental and financial losses is important.

ANALYSIS METHODS

Swan River State Forest is observed from the air annually and insect and disease problems are mapped. DNRC and USFS provide a report of the aerial reconnaissance with updates on insect and disease trends across the Inland Northwest. In addition to investigating these reports, DNRC personnel also include their own observations of additional forest health conditions as they occur on Swan River State Forest.

The focus on this timber sale project will include:

- the effects of insects, diseases, and wildfires;
- existing conditions in relation to the project or harvest areas;
- management recommendations; and
- potential sawlog-value losses to the trusts.

ANALYSIS AREA

The analysis area is primarily within the South Wood Timber Sale Project area.

Active insects and diseases of importance on the project area include:

- Douglas-fir bark-beetle - *Dendroctonus pseudotsugae*
- Western larch dwarf mistletoe - *Arceuthobium larici*
- White pine blister rust - *Cronartium ribicola*
- Mountain pine beetle - *Dendroctonus ponderosae*
- Indian paint fungus - *Echinodontium tinctorium*

Other insects and diseases are present in the project area, but are not recognized as having important management implications.

⇒ **Douglas-fir bark beetle (*Dendroctonus pseudotsugae*)**

Douglas-fir bark beetles are currently attacking large portions of the Inland Northwest's Douglas-fir populations. Swan River State Forest, including the project area, has extensive pockets of dead Douglas-fir across the landscape.

Douglas-fir bark beetles attack, specifically, Douglas-fir trees that are usually over 14 inches diameter at breast height (dbh), although smaller diameter trees are occasionally attacked. Generally, low populations of beetles will infest freshly blown-down or fire-killed trees or pockets of Douglas-fir trees infected with a root rot disease. With higher beetle populations, stands with low vigor and other stresses, such as drought or *Armillaria* root rot infections, are at higher risk to attack.

In 1999, numerous pockets of infestation were located east of the project area. Reconnaissance surveys were conducted following the spring 1999 and 2000 flight of the beetle by DNRC foresters to determine the extent of the infestation. It was estimated that the beetle had caused heavy mortality of Douglas-fir trees on approximately 2,500 acres. The *Forest Insect and Disease Identification and Management Handbook* provided guidance and State entomologist, Steve Kohler, recommend salvaging the infested trees prior to the beetle flight in the spring. The Swan River State Forest Timber Permit Program allowed for the salvage harvesting of approximately 2 MMBF of sawlogs in 1999 and 600 MBF in 2000.

A moderate incidence of Douglas-fir bark beetle attacks have occurred in the areas proposed for

harvesting. The Douglas-fir trees in most of the proposed harvest areas are at moderate risk due to their age and stocking density.

⇒ **White pine blister rust (*Cronartium ribicola*)**

White pine blister rust, a nonnative disease, is the primary cause for the decline in western white pine trees in the project area. Trees, seedling-sized to over 30 inches dbh, become infected from airborne spores. Some individual trees display a natural resistance to the infection, which may be either a genetic attribute or because exposure to the spores may be limited.

Western white pine trees are regarded as high-value sawlog material, averaging \$445 per MBF (University of Montana, 2000). Western white pine harvested from Stillwater State Forest's Werner/Taylor Timber Sale Project area and the 1999 area salvage permit averaged \$300 per MBF. This species has been highly favored by firewood gatherers. Dead tops are often associated with diseased western white pine; this reduces sawlog volume and value. The mountain pine beetle is often the final cause of mortality of trees stressed from blister rust.

Management recommends reestablishing stands of western white pine that have a measured resistance to blister rust and at a much higher representation than currently exists. Mature trees that show some resistance to the disease would be retained and additional rust-resistant seedlings would be planted.

⇒ **Western larch dwarf mistletoe
(*Irceuthobium laricis*)**

The western larch dwarf mistletoe appears to be patchily distributed over the project area. Mistletoe causes the branches to form dense clumps or "witches brooms". Infections in some old-growth stands have progressed enough to cause mortality, which is most common when minimal foliage is left to sustain life, giving the larch woodborer the opportunity to finally kill the tree. Old-growth portions of the project area have a high level of mortality relative to the younger age classes on Swan River State Forest.

Dwarf mistletoe is a parasite that generally spreads from overstory trees to young regeneration. It reduces the tree vigor and growth rate and the quality and quantity of the forest products produced; quality and quantity of tree seed produced; and predisposes trees to attacks by insects and infections by fungi (Wicker and Leaphart, 1974). The fire hazard is also increased due to the accumulation of fuels at the base of the tree.

Within old stands on the project area, scattered western larch overstory trees are obviously infected with the parasite. In the portions of the project area where western larch representation is much higher and trees are younger, the infections are not extensive or evident.

Firewood gatherers are aggressively salvaging dead western larch where road access is available.

⇒ **Mountain pine beetle (*Dendroctonus ponderosae*)**

Mountain pine beetles have infested many of the lodgepole pine stands in the project area at endemic levels. These stands evidence patches of dead trees, but due to the young age and low stocking levels, infestations have not spread to any great extent. Currently, stands in the project area are becoming old enough (more than 80 years old) to be at risk to major mountain pine beetle infestations.

⇒ **Indian Paint Fungus (*Echinodontium tinctorium*)**

Indian paint fungus is well distributed throughout the project area and is infecting the grand fir and subalpine fir trees. Stand-exam and reconnaissance surveys reveal that 15 to 20 percent of the grand fir and subalpine fir are infected with this decay. Generally, infected trees are rotten and have very little sawlog quality left in them. Infections from Indian paint spores may lie dormant for up to 50 years; dormant infections are activated by mechanical injuries, frost cracks, and other wounds (Filip et al., 1983). The Forest Insect and Disease Manual recommends that advanced regeneration that has developed under an infected overstory not be retained. Also recommended is to avoid damaging or wounding trees during harvesting operations, especially if retention of grand fir is planned, such as in a commercial-thin operation.

WILDFIRE HAZARDS AND RISKS IN THE SOUTH WOOD PROJECT AREA

The hazards and risks associated with wildfire include a potential loss of timber resources, effects to watersheds, and loss of property. The majority of timber stands being considered for harvesting are in the pole to mature age classes in stands that were burned in the 1890s.

Hazards in these areas are at near-natural levels, with relatively low accumulations of downed and ladder fuels relative to the high stocking levels. There are areas of fuel concentrations, especially where mountain pine beetle and other pathogens have killed groups of trees, but these are not widespread in the vicinity. While fire-suppression efforts may have prevented the occurrence of large, stand-replacing fires, this is not a frequent-fire regime, and no unusual fuel build-ups have developed due to fire suppression.

The old-growth stands in the vicinity are primarily relict stands that escaped the stand-replacing fires of the past. Their locations, aspect, moisture regimes, and chance have combined to allow them to be missed by past burns. As the stands age and die from various pathogens, there is a build-up of down dead fuels. In some stands there is an ingrowth of shade-tolerant trees that provide ground and ladder fuels, making these stands more susceptible to burning than in the past, especially during drought conditions. Accessible stands have had salvage logging and firewood cutting in the past, reducing the heavy down fuels in the area.

Another hazardous condition related to the start of fires in this area of Swan River State Forest is the increased recreational use and adjacent residential development. This adds an ignition source that was not present in the past.

Forest land adjacent to the project area has a wide range of fuel loading. Much of the adjacent Plum Creek ownership has been harvested in recent years and the resulting stands have a low wildfire risk due to light fuel loading.

INSECTS, DISEASES, AND WILDFIRE DIRECT EFFECTS

• Direct Effects of No-Action Alternative A

Sawlog volume would continue to be lost from the project area due to insect and disease effects, especially Douglas-fir bark beetles, in inaccessible stands with large trees. Salvage logging would continue where stands are accessible without building roads.

If No-Action Alternative A is implemented, no acres of western white pine cover types would be regenerated.

The wildfire hazard would not change substantially in the short term.

• Direct Effects Common to Action Alternatives B, C, D, E, and F

Where commercial-thin treatments are applied, the direct effect would be the removal of trees affected by insects and diseases and the salvage of recently dead trees. Snags meeting DNRC density guidelines would be left. The larger trees in the stands would be left as potential snag recruits to become available as they are affected by pathogens in the future. Due to the removal of the low-vigor and diseased trees, the average health of the trees would be increased.

Immediately following timber harvesting in the commercial-thin areas, the amount of fine flashy fuels would increase. The hazard would be reduced by scattering

slash, cutting limbs and tops to lay low to the ground to hasten decomposition, spot piling by machine in openings created by harvesting, and burning landing piles.

Where seedtree harvest treatments are applied, the direct effect would be to remove trees affected by insects and diseases, as well as trees with reduced growth rates due to old age (i.e. all merchantable trees with the exception of seedtrees). Snags meeting DNRC density guidelines would be left. Seedtrees, left as potential snag recruits, would become available as they are affected by pathogens in the future. Nonmerchantable reserve clumps would also be left. These would be selected for low disease incidence to avoid introducing pathogenic infections or insect infestations into regeneration. Due to the removal of low vigor and diseased trees, the average health of the remaining trees would be increased.

Immediately following timber harvesting in seedtree-harvest treatment areas, the amount of fine flashy fuels would be increased. The hazard would be reduced by excavator piling and burning slash and landing piles.

The acres of harvests by seedtree and commercial-thin methods by the alternative where these effects would occur are shown in TABLE C-3 - INDIRECT EFFECTS TO CANOPY COVERAGE BY ALTERNATIVE.

INSECT, DISEASE, AND WILDFIRE INDIRECT EFFECTS

• Indirect Effects of No-Action Alternative I

School trusts may lose long-term revenue due to:

- the mortality rate that is slowly increasing and increasing sawlog defect, which are caused by a

slow increase in the incidence of the variety of aforementioned pathogens and the reduced growth rates as old-growth stands continue to age and defects increase; and

- not regenerating high-valued species, such as western white pine.

Eventually, due to the continuing accumulation of fine fuels, snags, ladder fuels, and dead-wood components, the risk of a stand-replacement fire would increase.

• Indirect Effects Common to Action Alternatives B, C, D, E, and F

Where commercial-thin treatments are applied, the indirect effect would increase growth rates on the remaining trees due to the availability of light and moisture. The improved growth rates naturally make the trees more resistant to pathogens and insect attacks. Because the stands are not dominated by Douglas-fir, the potential for increasing the extent of *armillaria* root rot is low.

The hazard of wildfires in areas of commercial thin treatments would be reduced because larger trees that are more resistant to fires would be left and at wider spacings. Grand fir, some Douglas-fir, Engelmann spruce, and subalpine fir, which pose a higher crown-fire hazard because of their low-growing branches and combustible nature, would be removed. This would reduce the potential mortality from low- to moderate-intensity fires, but would not "fireproof" the stands from high-intensity, drought-and-wind-driven, stand-replacing fires.

Where seedtree harvests are applied, rust-resistant western white pine would be planted. If successful at resisting the white pine blister rust, these seedlings

would add a component that is missing in the stands.

Seedtree-harvest treatments would cause wildfire hazard to be reduced to a very low level. Past experience has demonstrated that regeneration harvests, where slash has been treated, but trees are still small, are fire resistant. Fire hazards would slowly increase over time as trees reach pole size and their crown density increases.

The acres of harvesting by seedtree and commercial-thin methods by the alternative where these effects would occur are shown in *TABLE C-3 - INDIRECT EFFECTS TO CANOPY COVERAGE BY ALTERNATIVE*.

CUMULATIVE EFFECTS OF INSECTS, DISEASES, AND WILDFIRES

• Cumulative Effects Common to Action Alternatives B, C, D, E, and F

In general, timber-management activities on Swan River State Forest have implemented prescriptions to reduce losses and recover mortality due to stem rots, Douglas-fir and mountain pine beetles, white pine blister rust, dwarf mistletoe, and blowdown. Where stand-replacing or regeneration prescriptions have been applied, the stands have been replaced with younger, less diseased trees. Thinning treatments have further reduced the percentage of infected or infested trees. The cumulative extent of these treatments is represented by *TABLE C-5-CUMULATIVE EFFECTS TO AGE CLASSES BY ALTERNATIVE*, where the 0-to-30-year age class is primarily a result of silvicultural treatments.

TABLE C-4-CUMULATIVE EFFECTS TO COVER TYPE ACREAGES BY ALTERNATIVE gives an estimate of the cumulative effects of thinning treatments. Where cover types have changed, the change is due to either

regeneration treatments (see *TABLE C-5-CUMULATIVE EFFECTS TO AGE CLASSES BY ALTERNATIVE*) or thinning to remove low-vigor trees.

Thinning lowers the incidence of pathogens and reduces the risk of stand-replacement fires.

The DNRC salvage program has removed some of the beetle-infested trees that were outside of the project area prior to the spring flight of the Douglas-fir bark beetle.

OLD GROWTH

On February 21, 2001, DNRC was required by a court ruling to undertake administrative rule-making under MAPA for its existing Biodiversity Guidance. Within the Biodiversity Guidance is DNRC's strategy for managing old-growth forests. As part of the court ruling, DNRC was enjoined from harvesting within old-growth forests until it complies with the procedural rule-making requirements of MAPA on its Biodiversity Guidance.

Additionally, DNRC has adopted the old-growth definitions proposed by Green et al. (1992). Another factor influencing DNRC old-growth management is Senate Bill 354, a new law that requires the trust to receive full-market value for any temporary or permanent deferrals of State forestland for natural areas, open space, old-growth preservation, and wildlife-management areas.

The South Wood Timber Sale Project was developed under these changing circumstances. For this reason, the South Wood Timber Sale Project DEIS analyzes effects to old growth using the working definition within the SFLMP Biodiversity Guidance. This FEIS analyzes old growth as defined by Green et al.

GREEN ET AL OLD GROWTH

Analysis Methods

Green et al old growth has been identified through the Swan River State Forest SLI database. Some stands have been field truthed with plots to verify whether they meet Green et al criteria. The analysis area consists of the Swan River State Forest management block and

stands being considered for harvesting at the project level.

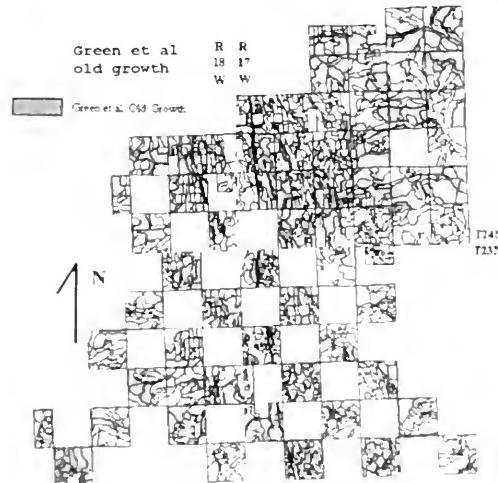
DESCRIPTION OF THE CURRENT DISTRIBUTION OF GREEN ET AL OLD GROWTH STANDS ON SWAN RIVER STATE FOREST.

TABLE C-6-CURRENT AMOUNT OF GREEN ET AL OLD GROWTH AND NON-OLD-GROWTH STANDS BY COVER TYPE IN SWAN RIVER STATE FOREST displays the current amount of Green et al old growth by

TABLE C-6-CURRENT AMOUNT OF GREEN ET AL OLD GROWTH AND NON-OLD-GROWTH STANDS BY COVER TYPE IN SWAN RIVER STATE FOREST

COVER TYPE	NON-OLD-GROWTH ACRES	GREEN ET AL OLD-GROWTH ACRES	TOTAL ACRES
Subalpine fir	2,337	1,114	3,451
Douglas-fir	480	0	480
Hardwoods	21	0	21
Lodgepole pine	2,316	0	2,316
Mixed conifer	10,340	7,028	17,368
Ponderosa pine	1,600	802	2,402
Western larch/Douglas-fir	5,835	1,915	7,750
Western white pine	1,831	1,930	3,761
TOTALS	24,760	12,789	37,549

FIGURE C-3 - SWAN RIVER STATE FOREST GREEN ET AL OLD GROWTH



cover type for Swan River State Forest. FIGURE C-3-SWAN RIVER STATE FOREST GREEN ET AL OLD GROWTH displays the distribution of old-growth stands across Swan River State Forest.

DIRECT EFFECTS TO GREEN ET AL OLD GROWTH

• ***Direct Effects Common to .III. Alternatives***

During the short term, fire-suppression efforts would likely maintain the existing old-growth structure.

• ***Direct Effects of No-Action .Alternative .I***

The amount, character, and distribution of existing old-growth stands would remain the same within the project area for the short term. Over time, existing cover types would change with natural plant succession.

• ***Direct Effects Common to .III. Action Alternatives***

The Green et al timber stands shown in TABLE C-7-GREEN ET AL OLD GROWTH PROPOSED FOR HARVESTING BY ALTERNATIVE are proposed for harvest under one or more of the alternatives.

TABLE C-8-CHANGES TO GREEN ET AL OLD GROWTH AFTER HARVESTING BY ALTERNATIVE shows acres of harvesting by harvest type in Green et al old-growth stands. Some road construction through Green et al old-growth stands not scheduled for harvest would be needed to provide access to the harvest units. The amount varies by alternative, as shown in TABLE C-8-CHANGES TO GREEN ET AL OLD GROWTH AFTER HARVESTING BY ALTERNATIVE.

INDIRECT EFFECTS TO GREEN ET AL OLD GROWTH

• ***Indirect Effects of No-Action .Alternative .I***

Not harvesting in old-growth stands would continue the existing risk of stand-replacement-type fires that would likely consume portions of the old growth in its path.

Existing open roads would continue to provide access to firewood gatherers, reducing the development of snags and coarse woody debris on those sites.

Over time and barring large-scale disturbances, old-growth attributes would increase on most cover types as trees die and fall over, climax species mature, and decadence increases.

• ***Indirect Effects Common to .Action Alternatives D and F***

Action Alternatives D and F do not propose harvesting, except for road right-of-way, within Green et al old growth. The amount, character, and distribution of existing old-growth stands would remain the same within the project area for the short term. Over time, existing cover types would change with natural plant succession.

Selective harvesting within mature stands would increase the diameter growth rates of remaining trees and, in some cases, may hasten the development of old-growth attributes, especially large-diameter trees. Some mature stands could be considered as old-growth recruits for future management.

• ***Indirect Effects Common to .Action Alternatives B, C, and E***

Selection harvesting within mature stands would increase the diameter growth rates of remaining trees and, in some cases, may hasten the

development of old-growth attributes, especially large-diameter trees. Some mature stands could be considered as old-growth recruits for future management.

CUMULATIVE EFFECTS TO GREEN ET AL OLD GROWTH

- Cumulative Effects Common to All Alternatives***

Since no old-growth will be harvested by the Small Squeezer and Small Squeezer II timber

TABLE C-7—GREEN ET AL OLD GROWTH PROPOSED FOR HARVESTING BY ALTERNATIVE

STAND ID NUMBER		INCLUDED IN ALTERNATIVES	TOTAL OLD-GROWTH ACRES PROPOSED FOR HARVESTING	COVER TYPE
Section	Stand			
2	20	B	27	Western white pine
10	09	C	33	Mixed conifer
12	06	B, C, E	32	Western white pine
12	08	B	29	Mixed conifer
12	10	B	20	Western white pine
12	11	B	7	Western white pine
12	24	B	10	Western white pine
14	27	B	16	Western white pine
22	17	E	60	Subalpine fir
23	06	B	3	Mixed conifer
23	07	B	30	Mixed conifer
26	25	C, E	52	Mixed conifer

TABLE C-8—CHANGES TO GREEN ET AL OLD GROWTH AFTER HARVESTING BY ALTERNATIVE

ACTION ALTERNATIVE	ACRES OF HARVEST	HARVEST TYPE	CHANGE EXPECTED	ROAD ACRES*
B	173	Seedtree	No longer old growth	0.5 acre
C	116	Commercial thin	Reduced decadence, reduced climax species, no longer meets Green et al definition.	0.5 acre
D	-0-	N/A	N/A	5.6 acres
E	53	Seedtree	No longer old growth	8.9 acres
	92	Commercial thin	Reduced decadence, reduced climax species, no longer meets Green et al definition	
F	-0-	N/A	N/A	0.5 acre

* 0.5 acre of Green et al old growth would be harvested as road right-of-way during the new road construction needed to access road NW 2538 system in Sections 23 and 24 to complete BMP work (see FIGURE II-2-PROJECT AREA MAP FOR ALTERNATIVE B).

sales, there would be no additional or cumulative effects to old-growth acreages compared to those listed in the Swan River State Forest SLI database. Cumulative effects for each alternative are the same as those shown in TABLES C-6-CURRENT AMOUNT OF GREEN ET AL OLD GROWTH AND NON-OLD-GROWTH STANDS BY COVER TYPE IN SWAN RIVER STATE FOREST, TABLE C-7-GREEN ET AL OLD GROWTH PROPOSED FOR HARVESTING BY ALTERNATIVE, and C-8-CHANGES TO GREEN ET AL OLD GROWTH AFTER HARVESTING BY ALTERNATIVE.

It may be important to note that timber stands, whether harvesting occurs or not, may be reinventoried or reindexed in regard to adjustments of stand boundaries or a more intensive inventory that may change the old-growth status.

Past road construction, timber harvesting, wildfires, and general site characteristics have led to the current amount of old-growth characteristics in the entire area. Future sales and thinning projects would likely continue to take place in the analysis area. If additional management projects were proposed, the MEPA process would be implemented.

SENSITIVE PLANTS

INTRODUCTION

DNRC has developed guidance for sensitive plant species to comply with Resource Management Standards 2, 6, and 9 in the SFLMP. The guidance calls for reference to databases for:

- potential plant occurrences,
- site surveys for proposed projects where plants or their habitat may be present,

- protecting important sites or site characteristics during management activities, and
- monitoring the success of mitigation measures applied during projects.

Numerous sensitive plants have been identified on Swan River State Forest; each part of the guidance was followed to identify and account for potential impacts. Monitoring would be completed during and following management activities.

ANALYSIS METHODS

The Montana Natural Heritage Program was contacted in July 2000 for a search of their database for plant species and related features of special concern in the vicinity of Swan River State Forest. Results of this search were then augmented by a site-specific on-the-ground survey of the project area. Locations of plant occurrences were then compared to proposed harvest sites for potential direct and indirect impacts of the proposal and development of mitigation measures, if needed.

The majority of sensitive plants and their related habitat features were found in wet meadows, fens, and riparian areas; these areas are not normally classified as forest stands or considered for timber-harvesting activities. Only 3 plant species and 5 occurrences were found within the South Wood Timber Sale Project area. Of the 3, 2 are associated with riparian areas; the other 1 is associated with moist areas of interior forest stands. The interior forest species inhabits western red cedar forests with high amounts of canopy cover over sparse competitive ground vegetation in close proximity to moist sites like springs (Pierce and Barton, 2000).

DIRECT EFFECTS TO SENSITIVE PLANTS

• Direct Effects of No Action Alternative I

Annual seasonal climatic variations and events like drought, flooding, trees blown down across streams, and beaver activities could alter water levels in wet areas, leading to increases or decreases in localized plant populations. Otherwise, there would be no effects to sensitive plants.

• Direct Effects Common to Action Alternatives B, C, D, E, and F

Riparian areas near proposed harvest units would be protected by marking SMZs and isolated wetlands. No harvesting is planned in SMZs, wetlands, or near springs or localized features. Sensitive plants associated with wetlands would not be directly affected by any harvesting operations. Prior to any harvest action, the project area will be resurveyed for plant populations in the interior forest. Most of the proposed harvest areas do not provide the cedar cover/sparse ground vegetation conditions needed by the identified plant species. If plant populations are found, the appropriate habitat areas would be excluded from the harvest units. None of the populations that were identified during the on-the-ground survey are within or adjacent to proposed harvest units in any alternative.

INDIRECT EFFECTS TO SENSITIVE PLANTS

Indirect Effects Common to Action Alternatives B, C, D, E, and F

Water-yield increases or a change in nutrient levels caused by timber harvesting could result in changes to water and nutrient levels in fens, streams, and wet meadows. Increased or decreased water or

nutrient levels could result in changes to local populations of sensitive plants. Given the level of proposed harvesting for this project, no measurable changes in water-yield or surface-water levels are anticipated from any proposed alternative. No change in nutrient levels would occur with the application of mitigation measures to prevent erosion and sediment delivery.

CUMULATIVE EFFECTS TO SENSITIVE PLANTS

Cumulative Effects Common to Action Alternatives B, C, D, E, and F

Water-yield increases caused by this proposal, together with other activities on Swan River State Forest, could result in changes to water or nutrient levels in fens, streams, and wet meadows. Increased or decreased water or nutrient levels could result in changes to local populations of sensitive plants. No measurable changes in water-yield or surface-water levels are anticipated from any of the proposed alternatives, given the level of proposed and active harvesting on State and other land in the project area and Swan River State Forest. No change in nutrient levels would occur with the application of mitigation measures to prevent erosion and sediment delivery.

NOXIOUS WEEDS

INTRODUCTION

Spotted knapweed (*Centaurea maculosa*) and common St. Johns-wort (*Hypericum perforatum*) populations have become established along road edges within the project area. Swan River State Forest has begun a program to reduce the spread and occurrence of noxious weeds.

DIRECT AND INDIRECT EFFECTS TO NOXIOUS WEEDS

• Direct and Indirect Effects of No-Action Alternative A

Noxious weed populations would continue as they exist. Weed seed would continue to be introduced by log hauling and logging on adjacent ownerships and recreational use of the forest. Swan River State Forest may initiate spot spraying to reduce noxious weed spread along roads under nontimber-harvest programs (Forest Improvement [FI]).

• Direct and Indirect Effects of Action Alternatives B, C, D, E, and F

Logging disturbance would provide opportunity for an increased establishment of noxious weeds; log hauling and equipment use would introduce seeds from other sites. Occurrences and the spread of noxious weeds would be reduced by mitigation measures designed to apply integrated weed-management techniques. Grass seeding of new and disturbed roads and landings and spot spraying of new infestations would reduce or prevent the establishment of new weed populations. Machinery washing and inspection would reduce the introduction of seeds into the forest. Roadside herbicide spraying would reduce existing weed populations. All herbicide spraying would be strictly controlled to follow label directions, prevent introduction of chemicals into riparian systems, and target only the intended species.

CUMULATIVE EFFECTS TO NOXIOUS WEEDS

Cumulative Effects of Action Alternatives B, C, D, E, and F

This proposed actions, together with other management and recreational activities on Swan River State Forest, would provide opportunities for the transfer of weed seed from various sites and an increased establishment of noxious weeds. Preventive actions through the County weed boards and active weed-management activities would be used to reduce the spread and establishment of noxious weeds and the resulting replacement of natural vegetation. Swan River State Forest would continue to provide some level of weed management through this action and with other management programs.

SOUTH WOOD TIMBER SALE PROJECT

WATERSHED AND HYDROLOGY ANALYSIS APPENDIX D

INTRODUCTION

SEDIMENT DELIVERY

Timber harvesting and related activities, such as road construction, can lead to water-quality impacts by increasing the production and delivery of fine sediment to streams. Constructing roads, skid trails, and landings can generate and transfer substantial amounts of sediment through the removal of vegetation and exposure of bare soil. In addition, removal of vegetation near stream channels reduces the sediment-filtering capacity and may reduce channel stability and the amounts of large woody material. Large woody debris is a very important component of stream dynamics, creating natural sediment traps and energy dissipaters to reduce the velocity and erosiveness of stream flows.

WATER YIELD

Timber harvesting and associated activities can affect the timing, distribution, and amount of water yield in a harvested watershed. Water yields increase proportionately to the percentage of canopy removal because removal of live trees reduces the amount of water transpired, leaving more water available for soil saturation and runoff. Canopy removal also decreases interception of rain and snow and alters snowpack distribution and snowmelt, which lead to further water-yield increases. Higher water yields may lead to increased peak flows and peak-flow duration, which can result in accelerated streambank erosion and sediment deposition.

ANALYSIS METHODS

SEDIMENT DELIVERY

Methodology for analyzing sediment delivery will be completed using a detailed sediment-source inventory. All roads and stream crossings were evaluated to determine sources of introduced sediment. Protocols are outlined in SFLMP Resource Management Standard 20 and in the Washington Forest Practices: Watershed Analysis Methodology. In addition, in-channel sources of sediment were identified using channel-stability rating methods developed by Pfankuch, and through the Bank Erodibility Hazard

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Rating Guide Developed by Rosgen (1990). These analyses were conducted in 1998 by a DNRC hydrologist and are summarized in a report titled, *Preliminary Assessment: Woodward Creek Watershed - Upland and In-Channel Sediment Source Inventory* (sediment-source inventory).

WATER YIELD

The water-yield increase for the watershed in the project area was determined using the ECA method as outlined in *Forest Hydrology Part II (1976)*. ECA is a function of total area roaded and harvested, percent of crown removed during harvesting, and amount of vegetative recovery that has occurred in the harvested areas. This method equates the area harvested and percent of crown removed with an equivalent amount of clearcut area. For example, if 100 acres had 60 percent of its crown removed, ECA would be approximately 60, or equivalent to a 60-acre clearcut. The relationship between crown removal and ECA is not a 1 to 1 ratio, so the percent ECA is not always the same as the percent of canopy removal. As live trees are removed, the water that would have evaporated and transpired either saturates the soil or is translated to runoff. This method also calculates the recovery of these increases as new trees vegetate the site and move toward preharvest water use.

In order to evaluate the watershed risk of water-yield increase effectively, a threshold of concern must be established. Watershed Resource Management Standards 7 in the SFLMP details the methodology for setting a water-yield-increase threshold. The procedure relies on evaluating the acceptable risk level, resource value, and watershed sensitivity. The watershed sensitivity is evaluated using qualitative assessments, as well as using procedures outlined in *Forest*

Hydrology Part II (1976). The stability of a stream channel is an important indicator of where a threshold of concern should be set. As water yields increase as a result of canopy removal, the amount of water flowing in a creek gradually increases. When these increases reach a certain level, the bed and banks may begin to erode. The more stable streams will be able to handle larger increases in water yield before they begin to erode, while less stable streams will experience erosion at more moderate water-yield increases.

ANALYSIS AREA

SEDIMENT DELIVERY

The analysis area for sediment delivery is the Woodward Creek watershed. Woodward Creek, a 16,269-acre watershed, is a perennial fourth-order tributary to Swan River. The analysis will cover all stream segments within the watershed and all roads and upland sites that may contribute sediment to Woodward Creek.

WATER YIELD

The analysis area for water yield is the Woodward Creek watershed. Due to the size of the Woodward Creek watershed, analysis was also done on the individual third-order tributaries that comprise Woodward Creek. Woodward Creek is a 16,025-acre fourth-order watershed. The third-order tributaries that form Woodward Creek are Main Woodward (6,811 acres) and South Woodward (9,214 acres).

EXISTING CONDITIONS

REGULATORY FRAMEWORK

Montana Surface Water-Quality Standards

According to MCA 17.30.608 (2)(a), the Swan River drainage, including Woodward Creek, is classified as B-1. Among other criteria for B-1 waters, no increases are allowed above naturally occurring levels of sediment, and minimal increases over natural turbidity. 'Naturally occurring,' as defined by MCA 17.30.602 (17), includes conditions or materials present during runoff from developed land where all BMPs have been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and the operations and maintenance procedures. Appropriate practices may be applied before, during, or after completion of potentially impactive activities.

Designated beneficial water uses within the project area include domestic water supply, coldwater fisheries, and recreational use in the wetlands and surrounding areas.

Water-Quality-Limited Waterbodies

The Woodward Creek watershed is not listed in the 1996 *List of Waterbodies in Need of Total Maximum Daily Load (TMDL) Development* (DEQ 1996).

SMZ Law

By the definition in ARM 26.6.601 (2)(c), the majority of the Woodward Creek watershed is a Class 1 stream. Main Woodward, South Woodward, and many of their tributaries have flow for more than 6 months each year. Many of these stream reaches also support fish. Some of the smaller

first-order tributaries may be classified as Class 2 or 3, based on site-specific conditions.

SEDIMENT DELIVERY

According to the sediment-source inventory, "Initial results of the upland sediment source inventories in both the South and Main Woodward creek drainages indicate that roads are not contributing significant levels of fine sediment to stream crossings." These findings were confirmed by field reconnaissance in the summer of 2000. Many of the stream crossings, particularly those in the South Woodward drainage, present a risk of fine-sediment routing due to inadequate surface drainage on the road system. Field review found that 5 stream crossings in the South Woodward watershed are contributing runoff from the road surface to the creek. Fill slopes on 4 of the 5 crossings are stable and vegetated. These sites are filtering some of the runoff from the road surface. One of the crossings lost its protective vegetation in December 2000 when an excavator slid off the road at the crossing. This resulted in the loss of vegetation on the downstream fill and delivery of sediment to the creek. Surface drainage on the existing road system needs to be upgraded to meet current BMP standards.

In addition to the crossing sites evaluated in the watershed inventory, there are 2 wooden culverts installed on perennial tributaries to the South Fork of Woodward Creek. These crossings are located on a closed-road system and are surfaced with road-fill material. Both are collapsing into the creek and are an existing sediment source to the South Fork of Woodward Creek.

The sediment-source inventory showed that most reaches of stream in the Woodward Creek watershed are in fair

to good condition. A few reaches were rated with poor channel stability. In addition, all reaches ranked between very good and moderate on the bank-erodibility index. The summary of the sediment-source inventory concluded, "In general, existing channel and bank conditions in the Main Woodward Creek drainage are good to excellent due to stable banks, intact riparian vegetation, and low bank-erodibility values."

WATER YIELD

Timber harvesting and associated road-construction activities have taken place in the Woodward Creek watershed since the 1960s. These activities, combined with the vegetative recovery that has occurred, have led to a 7 percent water-yield increase over an unharvested condition in the Woodward Creek watershed. The water-yield status of the Main Woodward and South Woodward Creek drainages was also evaluated. The Main Woodward watershed is currently 8 percent over an unharvested condition; the South Woodward watershed is 6.4 percent over the unmanaged condition. TABLE D-1 - CURRENT WATER YIELD AND ECA INCREASES IN WOODWARD WATERSHEDS summarizes the existing conditions for water-yield increases in the Woodward Creek watershed.

DIRECT EFFECTS

SEDIMENT DELIVERY

- ***Direct Effects of No-Action Alternative A on Sediment Delivery***

Alternative A would have no direct effects to sediment delivery beyond those currently occurring. Existing point sources of sediment, both in-channel and out-of-channel sources, would continue to recover or degrade based on natural or preexisting conditions.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F on Sediment Delivery***

Each action alternative would remove an existing wooden-stringer bridge from the main stem of Woodward Creek. The bridge is rotten and at high risk to collapse. The removal of the bridge and the rehabilitation and stabilization of the site would contribute sediment directly to Woodward Creek. This sediment would be minimized through the application of standard erosion-control measures. The sediment delivery anticipated from this project would be far less than the amount of sediment that would be delivered to the creek if the bridge is left in place and allowed to collapse.

Each of these alternatives would also construct 0.5 miles of new road in Section 25 of the proposed project area. This new construction would require the installation of 2 culverts on

TABLE D-1 - CURRENT WATER YIELD AND ECA INCREASES IN WOODWARD WATERSHEDS

	WOODWARD CREEK	MAIN WOODWARD	SOUTH WOODWARD
Percent of Water Yield Increase (WYI)	7.1	8.0	6.4
Allowable WYI	12	12	12
Existing ECA	2,878	1,331	1,547
Allowable ECA	4,808	2,043	2,764

perennial streams. Each stream has a 5-foot bankfull channel, approximately, and flows through a series of wetlands before reaching Woodward Creek. The installation of these culverts would deliver sediment to these creeks during the course of construction and for a short period of time after construction until the bare slopes revegetate.

The 0.5 mile of road discussed above ties into an existing road system that would be reconstructed under each action alternative. Reconstruction would involve the replacement of several culverts. Two of these wood-and-earth culverts are failing and falling into the creek. Also, 6 improperly designed metal culverts on live streams would be replaced. Each of these culvert replacements would contribute sediment to the creek during the installation process. A 318 Authorization (formerly 3A) for temporary turbidity related to construction activity may be required for these projects. All available measures of containment would be implemented to minimize the amount of sediment introduced into the creek. The expected impact to water quality is short term and temporary, lasting only through the duration of construction activity. All requirements of the Clean Water Act, Montana Stream Preservation Act, and SMZ Law would be met.

- ***Direct Effects Common to Action Alternatives C, D, E, and F on Sediment Delivery***

Each of these alternatives would directly affect sediment delivery to the Woodward Creek watershed through the replacement of 4 culverts in the South Woodward watershed. One culvert on an unnamed first-order tributary to the Swan River would also be replaced under these alternatives. These culverts are currently functioning, but are not designed

properly. Each of the culvert replacements would contribute sediment to the creek during the installation process. A 318 Authorization for temporary turbidity related to construction activity may be required for these projects. All available measures of containment would be implemented to minimize the amount of sediment introduced into the creek. The expected impact to water quality is short term, lasting only through the duration of construction activity. All requirements of the Clean Water Act, Montana Stream Preservation Act, and SMZ Law would be met.

WATER YIELD

- ***Direct Effects of No-Action Alternative A on Water Yield***

No Action Alternative A would have no direct effects on water yield. The water quantity would not be changed from present levels.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F on Water Yield***

These action alternatives would have no direct effects on water yield in the Woodward Creek watershed. None of the proposed activities in these alternatives would directly increase the quantity of water in Woodward Creek.

INDIRECT EFFECTS

SEDIMENT DELIVERY

- ***Indirect Effects of No-Action Alternative A on Sediment Delivery***

No-Action Alternative A would have no indirect effects on sediment delivery beyond those currently occurring. Existing sediment sources and roads with erosion-control problems would continue to recover or degrade based on natural or preexisting conditions.

- ***Indirect Effects Common to Alternatives B, C, D, E, and F on Sediment Delivery***

Each of the action alternatives would install surface drainage and erosion-control features on all proposed haul routes, bringing them up to current BMP standards. Indirect effects of these activities would create an increased risk of sediment delivery in the short term through the exposure of bare soil. The long-term indirect effect of these activities would be a net reduction in sediment delivery through improved road-surface drainage and a more-effective sediment filtration over the existing condition.

Action Alternatives B, C, D, E, and F would each remove a wooden-stringer bridge from the main stem of Woodward Creek. The bridge is rotten and at high risk to collapse. Indirect effects of this bridge removal would be a reduced risk of sediment delivery should the existing structure fail and collapse into the creek. A washout of the bridge would allow approximately 20 cubic yards of fill material to slump into the creek. The proposed removal and rehabilitation would eliminate the risk of delivery of this material.

Each action alternative would also construct 0.5 miles of new road in Section 25 of the proposed project area. This new construction would increase the risk of sediment delivery to the unnamed Woodward Creek tributaries located in Section 25. This risk would be minimized through the implementation of standard BMPs and erosion-control measures on the new construction. Once sites revegetate, risk of sediment delivery to creeks would be low.

The 0.5 miles of road discussed above ties into an existing road system that would be reconstructed

under each of the action alternatives. Reconstruction of this road would involve replacement of several stream-crossing structures and construction of surface-drainage features. These activities would indirectly affect sediment delivery by increasing the amount of bare soil, which would increase the risk of sediment delivery to a live stream. This increased risk would be a short-term effect. The long-term indirect effect of these proposed activities would be a decreased risk of sediment delivery through the removal of improperly designed structures. Properly designed structures have a much lower risk of failure and, in turn, a lower risk of sediment delivery. As bare soil revegetates on these sites, the improved erosion control on the road system would reduce the risk of sediment delivery to a live stream.

- ***Indirect Effects Common to Alternatives C, D, E, and F on Sediment Delivery***

In addition to the proposed activities listed above, Action Alternatives C, D, E, and F would propose the replacement of 4 culverts in the South Woodward drainage and pipe on an unnamed tributary to Swan River. Replacement of these stream crossings would indirectly affect sediment delivery by increasing the amount of bare soil, which would increase the risk of sediment delivery to a live stream. This increased risk would be a short-term effect. The long-term indirect effect of these proposed activities would be a decreased risk of sediment delivery through the removal of improperly designed structures. Properly designed structures have a much lower risk of failure and, in turn, a lower risk of sediment delivery. As bare soil revegetates on these sites, the

improved erosion control on the road system would reduce the risk of sediment delivery to a live stream.

- ***Indirect Effects of Action Alternative B on Sediment Delivery***

Indirect effects on sediment delivery from Action Alternative B would relate primarily to the existing and proposed road system. Beyond those effects described in *Indirect Effects Common to Action Alternatives B, C, D, E, and F*, Action Alternative B would harvest timber from approximately 313 acres. Approximately 303 of these acres would use ground-based yarding systems. Ground-based equipment creates ground disturbance and often removes the ground-cover vegetation on skid trails. Soil displacement and compaction also occur where ground-based machinery is operated. Displacement, compaction, and bare soil increase the risk of erosion and sediment delivery off site. Less than 15 percent of the ground-based skidding area would be in skid trails. With this alternative, approximately 61 acres of bare soil would be generated in the project area. The risk of sediment delivery to a stream or wetland as a result of Action Alternative B is low for the following reasons:

- None of the proposed harvest units is located within an SMZ.
- Vegetative buffers such as an SMZ are effective at filtering overland flow and sediment.
- All applicable BMPs (including skid-trail spacing, soil moisture, slope steepness, and erosion-control measures) would be applied to all skid trails.

- ***Indirect Effects of Action Alternative C on Sediment Delivery***

Indirect effects on sediment delivery from Action Alternative C would relate primarily to the existing and proposed road system. Beyond those effects described in *Indirect Effects Common to Action Alternatives B, C, D, E, and F* and *Indirect Effects Common to Actions Alternatives C, D, E, and F*, Action Alternative C would harvest timber from approximately 628 acres. Ground-based yarding systems would be used on approximately 302 of these acres. Ground-based equipment creates ground disturbance and often removes the ground-cover vegetation on skid trails. Soil displacement and compaction also occur where ground-based machinery is operated. Displacement, compaction, and bare soil increase the risk of erosion and sediment delivery off site. Less than 15 percent of the ground-based skidding area would be in skid trails. With this alternative, approximately 61 acres of bare soil in the project area would be generated. The risk of sediment delivery to a stream or wetland as a result of Action Alternative C is low for the following reasons:

- None of the proposed harvest units is located within an SMZ.
- Vegetative buffers, such as an SMZ, are effective at filtering overland flow and sediment.
- All applicable BMPs (including skid-trail spacing, soil moisture, slope steepness, and erosion-control measures) would be applied to all skid trails.

In addition to the 0.5 miles of road discussed above, Action Alternative C would construct an additional 2.3 miles of new road to access the proposed harvest units. Construction of these road segments would increase the risk of sediment

delivery to a live stream through the exposure of bare soil and construction of a ditch network. The risk of sediment delivery would be minimized through the implementation of all applicable BMPs, the installation of surface drainage and erosion-control features, and through the prompt grass seeding of all exposed soil. The risk of erosion and sediment delivery would decrease in 1 to 2 years as bare soil grows a vegetative cover. None of these proposed road segments would cross a live stream.

- ***Indirect Effects of Action Alternative D on Sediment Delivery***

Indirect effects on sediment delivery from Action Alternative D would relate primarily to the existing and proposed road system. Beyond those effects described in *Indirect Effects Common to Action Alternatives B, C, D, E, and F* and *Indirect Effects Common to Action Alternatives C, D, E, and F*, Action Alternative D would harvest timber from approximately 667 acres. Ground-based yarding systems would be used on approximately 205 of these acres. Ground-based equipment creates ground disturbance and often removes the ground-cover vegetation on skid trails. Soil displacement and compaction also occur where ground-based machinery is operated. Displacement, compaction, and bare soil increase the risk of erosion and sediment delivery off site. Less than 15 percent of the ground-based skidding area would be in skid trails. With this alternative, approximately 47 acres of bare soil in the project area would be generated. The risk of sediment delivery to a stream or wetland as a result of Action Alternative D is low for the following reasons:

- None of the proposed harvest units is located within an SMZ.

- Vegetative buffers such as an SMZ are effective at filtering overland flow and sediment.
- All applicable BMPs (including skid-trail spacing, soil moisture, slope steepness, and erosion-control measures) would be applied to all skid trails.

In addition to the 0.5 miles of road discussed above, Action Alternative D would construct an additional 4.9 miles of new road to access the proposed harvest units. Construction of these road segments would increase the risk of sediment delivery to a live stream through the exposure of bare soil and construction of a ditch network. The risk of sediment delivery would be minimized through the implementation of all applicable BMPs, the installation of surface drainage and erosion-control features, and the prompt grass seeding of all exposed soil. The risk of erosion and sediment delivery would decrease in 1 to 2 years as bare soil grows a vegetative cover. None of these proposed new road segments would cross a live stream.

- ***Indirect Effects of Action Alternative E on Sediment Delivery***

Indirect effects on sediment delivery from Action Alternative E would relate primarily to the existing and proposed road system. Beyond those effects described in *Indirect Effects Common to Alternatives B, C, D, E, and F* and *Indirect Effects Common to Alternatives C, D, E, and F*, Action Alternative E would harvest timber from approximately 570 acres. Ground-based yarding systems would be used on approximately 303 of these acres. Ground-based equipment creates ground disturbance and often removes the ground-cover vegetation on skid trails. Soil

displacement and compaction also occur where ground-based machinery is operated. Displacement, compaction, and bare soil increase the risk of erosion and sediment delivery off site. Less than 15 percent of the ground-based skidding area would be in skid trails. With this alternative, approximately 70 acres of bare soil in the project area would be generated. The risk of sediment delivery to a stream or wetland as a result of Action Alternative E is low for the following reasons:

- None of the proposed harvest units is located within an SMZ.
- Vegetative buffers such as an SMZ are effective at filtering overland flow and sediment.
- All applicable BMPs (including skid-trail spacing, soil moisture, slope steepness, and erosion-control measures) would be applied to all skid trails.

In addition to the 0.5 miles of road discussed above, Action Alternative E would construct an additional 4.3 miles of new road to access the proposed harvest units. Construction of these road segments would increase the risk of sediment delivery to a live stream through the exposure of bare soil and construction of a ditch network. The risk of sediment delivery would be minimized through the implementation of all applicable BMPs, the installation of surface drainage and erosion-control features, and through the prompt grass seeding of all exposed soil. The risk of erosion and sediment delivery would decrease in 1 to 2 years as bare soil grows a vegetative cover. None of these proposed new road segments would cross a live stream.

• *Indirect Effects of Action Alternative F on Sediment Delivery*

Indirect effects on sediment delivery from Action Alternative F would relate primarily to the existing and proposed road system. Beyond those effects described in Indirect Effects Common to Action Alternatives B, C, D, E, and F; and under *Indirect Effects Common to Action Alternatives C, D, E, and F*; Action Alternative F would harvest timber on approximately 514 acres. Approximately 229 of these acres would use ground-based yarding systems. Ground-based equipment creates ground disturbance and often removes the ground cover vegetation on skid trails. Soil displacement and compaction also occur where ground-based machinery is operated. Displacement, compaction, and bare soil increase the risk of erosion and sediment delivery off site. Less than 15 percent of the area in ground-based skidding would be impacted by skid trails. Approximately 46 acres of bare soil would be generated in the project area with this alternative. The risk of sediment delivery to a stream or wetland as a result of Action Alternative F is low for the following reasons:

- None of the proposed harvest units is located within an SMZ.
- Vegetative buffers, such as an SMZ, are effective at filtering overland flow and sediment.
- Applicable BMPs (including skid trail spacing, soil moisture, slope steepness, and erosion-control measures) would be applied to all skid trails .

In addition to the 0.5 miles of road discussed above, Action Alternative F would construct an additional 1.8 miles of new road to access the proposed harvest units. Construction of these road

segments would increase the risk of sediment delivery to a live stream through the exposure of bare soil and construction of a ditch network. The risk of sediment delivery would be minimized through implementation of all applicable BMPs, the installation of surface drainage and erosion-control features, and through the prompt grass seeding of all exposed soil. The risk of erosion and sediment delivery would decrease within 1 to 2 years as bare soil grows a vegetative cover. None of these proposed road segments would cross a live stream.

WATER YIELD

- ***Indirect Effects of No-Action Alternative A on Water Yield***

No-Action Alternative A would have no indirect effects on water yield. Existing harvest units would continue to revegetate and move closer to premanagement levels of water use and snowpack distribution.

- ***Indirect Effects of Action Alternative B on Water Yield***

Action Alternative B would indirectly affect water yield through the removal of live trees on approximately 313 acres. Removal of these live crowns would increase the water yield in Woodward Creek approximately 0.3 percent over the existing condition. The indirect effects of Action Alternative B were assessed on a third-order-watershed basis to ensure that the size of the Woodward Creek watershed did not dilute the effects of the proposed harvesting on water yield. Action Alternative B would increase the water yield 0.4 percent in the Main Woodward watershed and 0.2 percent in the South Woodward

watershed. These increases are minor, not measurable, and would not be sufficient to cause decreased channel stability.

- ***Indirect Effects of Action Alternative C on Water Yield***

Action Alternative C would indirectly affect water yield through the removal of live trees on approximately 628 acres. Removal of these live crowns would increase the water yield in Woodward Creek approximately 0.5 percent over the existing condition. The indirect effects of Action Alternative C were assessed on a third-order-watershed basis to ensure that the size of the Woodward Creek watershed did not dilute the effects of the proposed harvesting on water yield. Action Alternative C would increase the water yield 0.4 percent in the Main Woodward watershed and 0.6 percent in the South Woodward watershed. These increases are minor, not measurable, and would not be sufficient to cause decreased channel stability.

- ***Indirect Effects of Action Alternative D on Water Yield***

Action Alternative D would indirectly affect water yield through the removal of live trees on approximately 667 acres. Removal of these live crowns would increase the water yield in Woodward Creek approximately 0.6 percent over the existing condition. The indirect effects of Action Alternative D were assessed on a third-order-watershed basis to ensure that the size of the Woodward Creek watershed did not dilute the effects of the proposed harvesting on water yield. Action Alternative D would increase the water yield 0.3 percent in the Main Woodward watershed and 0.8 percent in the South Woodward

watershed. These increases are minor, not measurable, and would not be sufficient to cause decreased channel stability.

- *Indirect Effects of Action Alternative E on Water Yield*

Action Alternative E would indirectly affect water yield through the removal of live trees on approximately 570 acres. Removal of these live crowns would increase the water yield in Woodward Creek approximately 0.5 percent over the existing condition. The indirect effects of Action Alternative E were assessed on a third-order-watershed basis to ensure that the size of the Woodward Creek watershed did not dilute the effects of the proposed harvesting on water yield. Action Alternative E would increase the water yield 0.1 percent in the Main Woodward watershed and 0.9 percent in the South Woodward watershed. These increases are minor, not measurable, and would not be sufficient to cause decreased channel stability.

- *Indirect Effects of Action Alternative F on Water Yield*

Action Alternative F would indirectly affect water yield through the removal of live trees on approximately 514 acres. Removal of these live crowns would increase the water yield in Woodward Creek approximately 0.4 percent over the existing condition. The indirect effects of Action Alternative F were assessed on a third-order-watershed basis to ensure that the size of the Woodward Creek watershed did not dilute the effects of the proposed harvesting on water yield. Action Alternative F would increase the water yield 0.3 percent in the Main Woodward watershed and 0.4

percent in the South Woodward watershed. These increases are minor, not measurable, and would not be sufficient to cause decreased channel stability.

CUMULATIVE EFFECTS

SEDIMENT DELIVERY

- *Cumulative Effects of No Action Alternative on Sediment Delivery*

The cumulative effects of No-Action Alternative A on sediment delivery would be very similar to those described in the existing-condition portion of this analysis. In the long-term, the risk of sediment delivery may increase as a result of not replacing failing stream-crossing sites and rehabilitating the old bridge site on Main Woodward Creek. All existing sources of sediment would continue to recover or degrade as dictated by natural and preexisting conditions until a source of funding became available to repair them. Sediment loads would remain at or near present levels.

- *Cumulative Effects Common to Action Alternatives B, C, D, E, and F on Sediment Delivery*

All action alternatives would increase the risk of sediment delivery to Woodward Creek through ground-based yarding and new road construction. Harvesting and road-construction activities listed in the direct and indirect effects sections would create bare soil and increase the risk of sediment delivery to a live stream. When coupled with past road-management and harvesting activities, sediment delivery at the outlet of Woodward Creek may be increased over current levels. Risk of adverse cumulative impacts to sediment would be reduced

through implementation of all applicable BMPs.

The cumulative effects to sediment delivery under each of these alternatives would be primarily related to road work and the stream-crossing replacements or removals. The sediment generated by the proposed removal of stream-crossing structures, rehabilitation of the bridge site on the main stem of Woodward Creek, and from the replacement of culverts would increase the total sediment load in Woodward Creek for the duration of activities. In the long term, the cumulative effects to sediment delivery would be a reduction from existing levels. As the sites stabilize and revegetate, sediment levels resulting from these crossing removals would be lowered compared to current levels. Over the long term, cumulative sediment loads would be reduced due to better designed crossings and functioning

surface drainage. Improved design would reduce the risk of structure failure, which would reduce the risk of sediment delivery to the outlet of Woodward Creek.

The installation and improvement of erosion-control and surface-drainage features on existing roads would also affect the cumulative sediment delivery in Woodward Creek. In the short term, the exposure of bare soil would increase the risk of sediment delivery to Woodward Creek. An increase in sediment load to Woodward Creek is possible as a result of this work. Applicable BMPs would be applied during this work and would make increased sediment loads unlikely. Over the long term, cumulative sediment delivery to Woodward Creek would likely decrease with the installation of more effective surface drainages and erosion-control features on the existing road system.



Following all laws, rules, and regulations pertaining to water keeps the streams free of sediment.

WATER YIELD

• Cumulative Effects of No Action, Alternative A on Water Yield

No-Action Alternative A would have no cumulative effects on water yield. Existing timber harvest units would continue to revegetate and move closer to premanagement levels of water use and snowpack distribution.

• Cumulative Effects of Action, Alternatives B, C, D, E, and F on Water Yield

The removal of trees proposed in the action alternatives would increase the water yield in the Woodward Creek watershed from its current level of 7.1 percent over unharvested to 7.4, 7.6, 7.7, 7.6, and 7.5 percent, respectively. These WYIs and their associated ECA levels include the impacts of all past management activities, existing and proposed roads, proposed timber harvesting, and

vegetative hydrologic recovery in the Woodward Creek watershed. The WYI expected from the action alternatives leaves the watershed well below the established threshold of concern. No impacts to water quality are expected as a result of the action alternatives.

Cumulative impacts to water yield were analyzed for the third-order watersheds that make up the Woodward Creek watershed. This was done to ensure that the size of the Woodward Creek watershed would not dilute the impacts of the proposal. The results for the Woodward Creek, Main Woodward Creek, and South Woodward Creek watersheds are displayed in TABLE D-2 - WATER YIELD AND ECA INCREASES IN WOODWARD CREEK; TABLE D-3 - WATER YIELD AND ECA INCREASES IN MAIN WOODWARD CREEK; and D-4 - WATER YIELD AND ECA INCREASES IN SOUTH WOODWARD CREEK.

TABLE D-2 - WATER YIELD AND ECA INCREASES IN WOODWARD CREEK

	ALTERNATIVE					
	A	B	C	D	E	F
Allowable WYI	12%	12%	12%	12%	12%	12%
WYI Percent	7.1	7.4	7.6	7.7	7.6	7.5
Acres harvested	0	313	628	667	570	514
Miles of new road	0	0.5	2.8	5.4	4.8	2.3
ECA generated	0	309	260	283	297	175
Total ECA	2,878	3,187	3,138	3,161	3,175	3,053
Remaining ECA	1,930	1,621	1,670	1,647	1,633	1,754
Allowable ECA	4,808	4,808	4,808	4,808	4,808	4,808

TABLE D-3 - WATER YIELD AND ECA INCREASES IN MAIN WOODWARD CREEK

	ALTERNATIVE					
	A	B	C	D	E	F
Allowable WYI	12%	12%	12%	12%	12%	12%
WYI Percent	8.0	8.4	8.4	8.3	8.1	8.3
Acres harvested	0	179	265	202	48	202
Miles of new road	0	0	0	0	1.0	0
ECA generated	0	176	106	81	22	77
Total ECA	1,331	1,507	1,437	1,412	1,353	1,408
Remaining ECA	712	536	606	631	690	635
Allowable ECA	2,043	2,043	2,043	2,043	2,043	2,043

TABLE D-4 - WATER YIELD AND ECA INCREASES IN SOUTH WOODWARD CREEK

	ALTERNATIVE					
	A	B	C	D	E	F
Allowable WYI	12%	12%	12%	12%	12%	12%
WYI Percent	6.4	6.6	7.0	7.2	7.3	6.8
Acres harvested	0	134	363	465	522	312
Miles of new road	0	0.5	2.8	5.4	3.8	2.3
ECA generated	0	133	154	202	274	98
Total ECA	1,547	1,680	1,701	1,749	1,821	1,645
Remaining ECA	1,217	1,084	1,063	1,015	943	1,119
Allowable ECA	2,764	2,764	2,764	2,764	2,764	2,764

SOUTH WOOD TIMBER SALE PROJECT

FISHERIES APPENDIX E

INTRODUCTION

The Woodward Creek watershed contains a population of bull trout. The Federal Endangered Species Act lists the bull trout as a threatened species. In an effort to protect existing bull trout populations and aid in the recovery of the species, DNRC is a member of the Montana Bull Trout Recovery Team. DNRC is committed to following the recommendations of the Recovery Team, as well as the recommendations of the Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Program (Cooperative Program).

ANALYSIS METHODS

The methodology used to determine presence/absence of fish in the Woodward Creek watershed was through electrically shocking the water and capturing fish. DFWP personnel conducted this work.

The methodology used to assess the status and potential impacts of the proposal to fish populations will include habitat-quality monitoring,

population monitoring, and risk factors to habitat degradation. Habitat-quality parameters include substrate scoring and streambed core sampling for the percent of materials less than 6.35 millimeters in diameter (McNeil coring). Measurement protocols for these parameters are outlined in the Cooperative Program report. According to the Cooperative Program report, a stream is considered threatened if the substrate score is less than 10 or if the percentage of fine material is greater than 35 percent. A stream is considered impaired if the substrate score is less than 9 or the percentage of fine material is greater than 40 percent.

The risk factors to habitat degradation were evaluated in 1998 through a detailed sediment-source inventory. The inventory included cataloging channel stability and in-channel and out-of-channel sediment sources.

ANALYSIS AREA

The area for the fisheries analysis is the Woodward Creek watershed. Data for the population and habitat-quality monitoring has been gathered in both the Main Woodward and South Woodward watersheds since 1996. Main Woodward and South Woodward creeks are third-order watersheds that comprise the Woodward Creek watershed.

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EXISTING CONDITIONS

Surveys of species composition in the Woodward Creek watershed have identified the presence of brook trout, resident cutthroat trout, and bull trout.

The Recovery Team has identified the Woodward Creek watershed as a bull trout core area. Core areas are defined as, "...watershed, including tributary drainages and adjoining uplands, used by migratory bull trout for spawning and early rearing, and by resident bull trout for all life history requirements (Montana Bull Trout Restoration Team, 2000)." In keeping with the recommendations of the Restoration Team and the DFWP biologists, DNRC has committed to a monitoring program in the Woodward Creek watershed. The sampling in the watershed began in the summer of 1996 and is ongoing. This monitoring would continue for a minimum of 3 years after the completion of a project in the Woodward Creek drainage. Results of the sampling are listed in TABLES E-1 - FISHERIES MONITORING DATA FOR MAIN WOODWARD and E-2 - FISHERIES MONITORING DATA FOR SOUTH WOODWARD. The results show some fluctuation in spawning occurrences, but an overall healthy population. Substrate scores are in the acceptable range in both Main and South Woodward. McNeil core results are in the threatened level for Main Woodward, but within acceptable levels in the South Woodward watershed. Management implications and commitments for threatened habitat are listed in the Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Study.

The sediment-source inventory conducted in 1998 listed no identifiable point sources of sediment within the channels and found no substantial sources of sediment from upland sites. The existing road system is in need of additional surface drainage and

erosion control, but no instances of direct delivery to a stream were found during the survey. Field review found that 5 stream crossings in the South Woodward watershed are contributing road surface runoff to the creek. Fill slopes on 4 of the 5 crossings are stable and vegetated. These sites are filtering some of the runoff from the road surface. One of the crossings lost its protective vegetation in December 2000 when an excavator slid off the road at the crossing. This resulted in loss of vegetation on the downstream fill, and delivery of sediment to the creek. None of the existing stream-crossing structures in the Woodward Creek watershed was identified as a fish-passage barrier. Stream channels in the proposed project area are primarily in fair to good condition. The results of this inventory, along with a water-yield analysis, indicate no management-induced reasons for the Main Woodward drainage to be listed as threatened.

TABLE E-1 - FISHERIES MONITORING DATA FOR MAIN WOODWARD

FISCAL YEAR	BULL TROUT REDDS	SUBSTRATE SCORE	MCNEIL CORE
1997	72	10.4	35.6
1998	56	10.7	37.2
1999	55	10.9	35.8
2000	53	10.6	N/A

TABLE E-2 - FISHERIES MONITORING DATA FOR SOUTH WOODWARD

Fiscal Year	Bull Trout Redds	Substrate Score	McNeil Core
1997	n/a	n/a	30.0
1998	18	9.6	34.1
1999	26	10.0	33.1
2000	10	10.0	n/a

DIRECT EFFECTS

• *Direct Effects of No Action, Alternative I*

This alternative would have no direct effects on fish populations in the Woodward Creek watershed. Direct effects would be limited to those under current and natural conditions.

• *Direct Effects Common to Action Alternatives B, C, D, E, and F*

Each of these action alternatives propose to remove a bridge in the Main Woodward watershed. The bridge is constructed of wood that is rotten and is at high risk to collapse and fall into the creek. Removal of this bridge and rehabilitation and stabilization of the site would result in some sediment entering Main Woodward Creek. These action alternatives also propose the installation of 2 live stream crossings on an unnamed tributary to South Woodward Creek and the replacement of 8 culverts on unnamed tributaries to South Woodward Creek. All of the culverts proposed for replacement are located on perennial streams. None are known to contain bull trout, but may contain brook trout or resident westslope cutthroat trout. Each of these culverts is improperly designed and at high risk to deliver sediment to the creek. Locations of these proposed replacements are shown on the attached map, FIGURE E-1 - CMP REPLACEMENT AND BRIDGE REHABILITAION SITES BY ALTERNATIVE. Completion of these proposed activities would create some sediment delivery to the creeks. Erosion control and mitigation measures would minimize the amount of sediment delivered at all of these sites. This sediment would temporarily increase the turbidity of the creeks during the period of

operation. This turbidity may affect fish found in these tributaries. Timing of the proposed activities would follow guidelines set forth by DFWP through the 124 Permit.

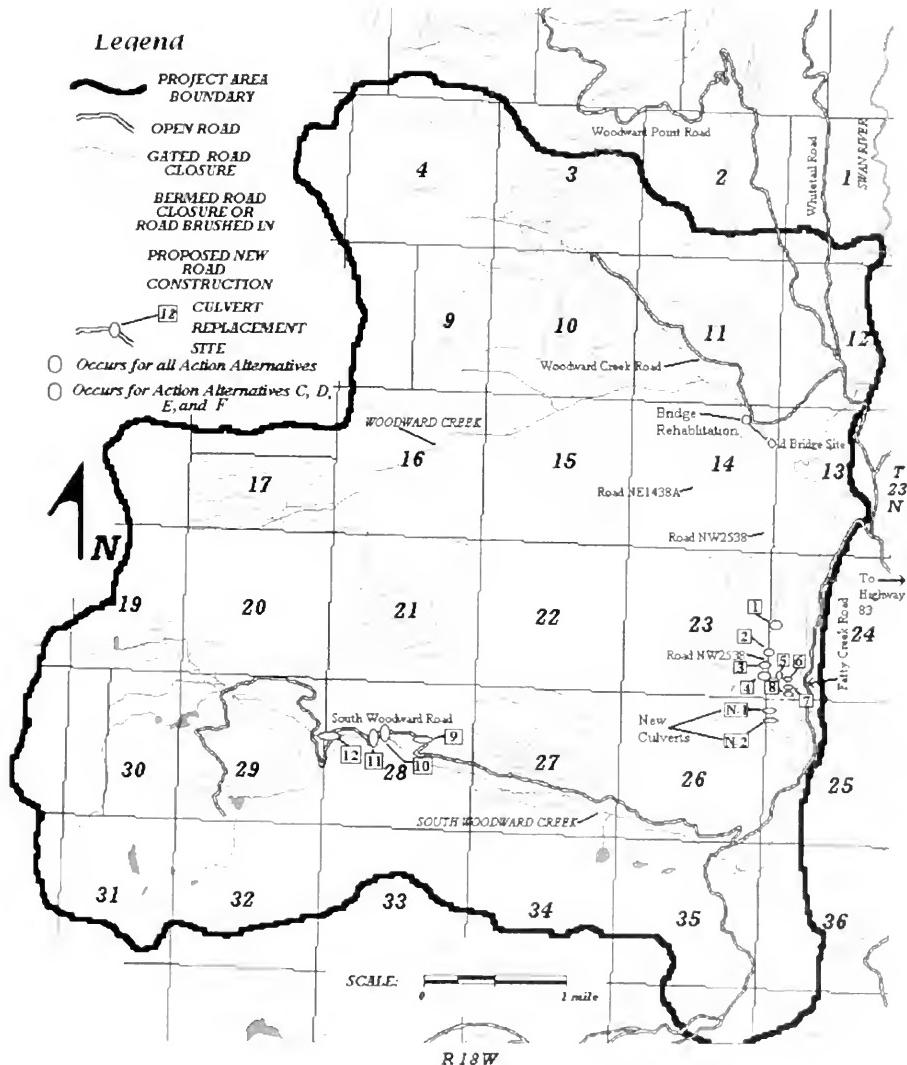
• *Direct Effects Common to Action Alternatives C, D, E, and F*

Action Alternatives C, D, E, and F each propose to replace 4 stream crossings on the main road system in South Woodward. All of the culverts proposed for replacement are located on perennial streams. None of the streams are known to contain bull trout, but may contain brook trout or resident westslope cutthroat trout. These culverts are currently functioning, but are not designed properly and would be replaced with longer culverts to better accommodate erosion control and BMPs. Their locations are shown on the map in FIGURE E-1 - CMP REPLACEMENT AND BRIDGE REHABILITAION SITES BY ALTERNATIVE. Completing these proposed activities would create some sediment delivery to the creeks, though erosion control and mitigation measures would minimize the amount of sediment delivered on all of these sites. This sediment would temporarily increase the turbidity of the creeks during the period of operation. This turbidity may affect fish found in these tributaries. The timing of the proposed activities would follow guidelines set forth by DFWP through the 124 Permit.

• *Direct Effects of Action Alternative B*

No direct effects to fish populations are expected beyond those described in Direct Effects Common to Action Alternatives B, C, D, E, and F as a result of Action Alternative B.

FIGURE E-1 - CMP REPLACEMENT AND BRIDGE REHABILITATION SITES BY ALTERNATIVE



- ***Direct Effects of Action .Alternative C***

No direct effects to fish populations are expected beyond those described in *Direct Effects Common to Action Alternatives B, C, D, E, and F* and *Direct Effects Common to Action Alternatives C, D, E, and F* as a result of Action Alternative C.

- ***Direct Effects of Action .Alternative D***

No direct effects to fish populations are expected beyond those described in *Direct Effects Common to Action Alternatives B, C, D, E, and F* and *Direct Effects Common to Action Alternatives C, D, E, and F* as a result of Action Alternative D.

- ***Direct Effects of Action .Alternative E***

No direct effects to fish populations are expected beyond those described in *Direct Effects Common to Action Alternatives B, C, D, E, and F* and *Direct Effects Common to Action Alternatives C, D, E, and F* as a result of Action Alternative E.

- ***Direct Effects of Action .Alternative F***

No direct effects to fish populations are expected beyond those described in *Direct Effects Common to Action Alternatives B, C, D, E, and F* and *Direct Effects Common to Action Alternatives C, D, E, and F* as a result of Action Alternative F.

INDIRECT EFFECTS

- ***Indirect Effects of No Action .Alternative J***

This alternative would have no indirect effects to fish populations beyond those currently occurring. Risk of bridge failure on Main Woodward would remain and increase as time passes.

Improperly designed culverts would also remain a risk of failure. Existing conditions would continue to affect fish habitat and populations based on natural or preexisting conditions.

- ***Indirect Effects Common to Action .Alternatives B, C, D, E, and F***

Each of these action alternatives propose to remove a bridge, install 2 new culverts, and replace 8 improperly designed stream crossings. These activities would deliver sediment to the creek during the course of operation. This sediment may indirectly affect fish populations by generating fine sediment and, subsequently, may deposit sediment on the spawning gravel. The sediment generated would be a short-duration event, not a chronic one. The timing of the proposed activities would follow guidelines set forth by DFWP's 124 Permit, which would minimize the risk of affecting spawning sites. Risk of fine-sediment delivery to spawning sites is low since all spawning occurs below Woodward Meadows. Woodward Meadows act as a migration deterrent due to its low gradient and higher temperature. The meadows would trap any sediment that may be generated by these projects and prevent it from reaching spawning sites.

These alternatives would also propose to construct approximately 0.5 miles of new road. Construction of new road creates a higher risk of sediment delivery to a live stream. Through implementation of standard BMPs and erosion-control measures, this risk would be reduced. The likelihood of affecting fish populations through this road construction is low.

Action Alternatives B, C, D, E,

system used to access the project up to current BMP standards, which would reduce the risk of fine-sediment delivery to a live stream. This reduced risk would create a potential benefit to fish populations through a reduction of fine-sediment deposition in spawning gravel.

- *Indirect Effects Common to Action Alternatives C, D, E, and F*

In addition to the indirect effects listed in the previous section, Action Alternatives C, D, E, and F would indirectly affect fish populations through the replacement of 4 culverts on the South Woodward road system. These culverts are currently functioning, but are not designed properly. Replacement of these culverts would deliver sediment to the creek during the course of operation. This sediment may indirectly affect fish populations by generating fine sediment and, subsequently, may deposit sediment on the spawning gravel. The sediment generated would be a short-duration event, not a chronic one. The timing of the proposed activities would follow guidelines set forth by DFWP's 124 Permit. Following these requirements would minimize the risk of affecting spawning sites. The risk of fine-sediment delivery to spawning sites is low since spawning occurs below Woodward Meadows. Woodward Meadows act as a migration deterrent due to its low gradient and higher temperature. The meadows would trap any sediment that may be generated by these projects and prevent it from reaching spawning sites.

- *Indirect Effects of Action Alternative B*

In addition to the indirect effects listed under *Indirect Effects Common to Action*

Alternatives B, C, D, E, and F. Action Alternative B would increase the risk of fine-sediment delivery to a spawning stream through ground-based timber harvesting on approximately 303 acres. The risk of fine-sediment delivery to a spawning stream and the subsequent deposition in spawning beds would be low for the following reasons:

- the requirements of the SMZ Law would be met or exceeded with this action alternative,
- none of the proposed timber harvesting would take place in an SMZ containing bull trout, and
- all applicable BMPs would be applied to minimize the risk of fine-sediment delivery to a spawning stream.

- *Indirect Effects of Action Alternative C*

In addition to the indirect effects listed under *Indirect Effects Common to Action Alternatives B, C, D, E, and F* and *Indirect Effects Common to Action Alternatives C, D, E, and F*, Action Alternative C would increase the risk of fine-sediment delivery to a spawning stream through ground-based timber harvesting on approximately 302 acres. The risk of fine-sediment delivery to a spawning stream and the subsequent deposition in spawning beds would be low for the following reasons:

- the requirements of the SMZ Law would be met or exceeded with this action alternative,
- none of the proposed timber harvesting would take place in an SMZ containing bull trout, and
- all applicable BMPs would be applied to minimize the risk

of fine-sediment delivery to a spawning stream.

- ***Indirect Effects of Action Alternative D***

In addition to the indirect effects listed under *Indirect Effects Common to Action Alternatives B, C, D, E, and F* and *Indirect Effects Common to Action Alternatives C, D, E, and F*, Action Alternative D would increase the risk of fine-sediment delivery to a spawning stream through ground-based timber harvesting on approximately 235 acres. The risk of fine-sediment delivery to a spawning stream and the subsequent deposition in spawning beds would be low for the following reasons:

- the requirements of the SMZ Law would be met or exceeded with this action alternative,
- none of the proposed timber harvesting would take place in an SMZ containing bull trout, and
- all applicable BMPs would be applied to minimize the risk of fine-sediment delivery to a spawning stream.

a spawning stream and the subsequent deposition in spawning beds would be low for the following reasons:

- the requirements of the SMZ Law would be met or exceeded with this action alternative,
- none of the proposed timber harvesting would take place in an SMZ containing bull trout, and
- all applicable BMPs would be applied to minimize the risk of fine-sediment delivery to a spawning stream.

- ***Indirect Effects of Action Alternative F***

In addition to the indirect effects listed under *Indirect Effects Common to Action Alternatives B, C, D, E, and F* and *Indirect Effects Common to Action Alternatives C, D, E, and F*, Action Alternative F would

increase the risk of fine-sediment delivery to a spawning stream through ground-based timber harvesting on approximately 229 acres. The risk of fine-sediment delivery to a spawning stream and the subsequent deposition in spawning beds would be low for the following reasons:

- the requirements of the SMZ Law would be met or exceeded with this action alternative,
- none of the proposed timber harvesting would take place in an SMZ containing bull trout, and
- all applicable BMPs would be applied to minimize the risk of fine-sediment delivery to a spawning stream.

- ***Indirect Effects of Action Alternative E***

In addition to the indirect effects listed under *Indirect Effects Common to Action Alternatives B, C, D, E, and F* and *Indirect Effects Common to Alternatives C, D, E, and F*, Action Alternative E would increase the risk of fine-sediment delivery to a spawning stream through ground-based timber harvesting on approximately 350 acres. The risk of fine-sediment delivery to

CUMULATIVE EFFECTS

- *Cumulative Effects of No-Action Alternative I*

The cumulative effects of this alternative would be similar to those described in the existing conditions. In the long term, bull trout populations may be adversely affected. Failed wooden stream crossings would continue to contribute sediment to the creek, and the failing wooden bridge on Main Woodward Creek would become a higher risk of failure and sediment delivery to spawning beds as it continues to age. Fish habitat and populations would not be altered by this alternative.

- *Cumulative Effects Common to Action Alternatives B, C, D, E, and F*

The cumulative effects of these alternatives would be related primarily to the risk of fine-sediment delivery to a spawning stream. The risk of increased sediment loads from in-channel sources is unlikely because the allowable water-yield increase would not be met or exceeded with these alternatives. Introduced sources of sediment would be related primarily to proposed stream-crossing removals and replacements. These impacts would be short term during the course of operation. On completion of work,

the supply of fine sediment would return to levels described in the existing conditions.

The effects of past management have not led to any identified sources of sediment to spawning sites in the Woodward Creek watershed. The inclusion of the direct and indirect effects expected from the action alternatives to the existing conditions would have a low risk of changing this. As a result, the proposed action alternatives would have little cumulative impact on fisheries populations in the Woodward Creek watershed or in downstream waters. Bull trout populations may be adversely affected by this proposal in the short-term. This is due primarily to sediment production from the proposed bridge rehabilitation in the Main Woodward drainage. Fine sediment from this bridge removal may reach spawning beds, which could affect the survival of fry. The reductions in fine sediment expected through culvert replacement and improvement of erosion control on the road system would reduce the risk of fine-sediment delivery to spawning sites. Cumulatively, this has the potential to improve the status to bull trout populations in the Woodward Creek watershed.

SOUTH WOOD TIMBER SALE PROJECT

WILDLIFE ANALYSIS APPENDIX F

INTRODUCTION

This section describes the existing environment and discusses the effects of the proposed project pertaining to wildlife. This description occurs on 2 scales. The first scale relates to the project area and/or the units proposed for harvesting. Full descriptions for the project area and proposed harvest units are presented in Chapter II. The second scale relates to the surrounding landscape and varies according to the species being discussed. Under each grouping or species heading, the size and description for the cumulative effects analysis area will be defined. If habitat does not exist in the project area, the species will be dropped from this analysis.

METHODS

To assess the existing condition of the project area and surrounding landscape, a variety of techniques were used. Field visits, scientific literature, SLI data, aerial photography, data from the Montana Natural Heritage Program, and consultations with other professionals provided information for the following discussion and effects analysis. In the effects analysis, the changes of habitat quality and quantity from the existing conditions were calculated and explained. Specialized methodologies are discussed under the species in which they apply.

COARSE-FILTER ASSESSMENT

DNRC recognizes that it is an impossible and unnecessary task to assess an existing environment or the effects of the proposed actions on all wildlife species. We assume that if landscape patterns and processes similar to those that species adapted to are maintained, then the full complement of species will be maintained across the landscape (DNRC 1996). This "coarse filter" approach supports diverse wildlife populations by managing for a variety of forest structures and compositions that

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approximate historic conditions across a landscape. To compare present and historical conditions across the landscape, the analysis was conducted on the entire Swan River State Forest using the SLI database (refer to *VEGETATION ANALYSIS*) and was compared to the historical assessment compiled for the Upper Flathead Climatic Section (Losensky 1997).

COVER TYPES

Fire suppression and timber harvesting changed the cover types and structure of habitats on Swan River State Forest. Generally, Swan River State Forest supports more moist (mixed conifer, western larch/Douglas-fir, western white pine) and dry (ponderosa pine) cover types and less cool (subalpine fir, lodgepole pine) habitat types than found on average for the climatic type. Therefore, these habitats are more available on Swan River State Forest than on the average in the climatic section. Species, such as cavity-nesting birds, are more likely to be found or have higher densities on Swan River State Forest, while species such as pine marten are less likely to occur or occur in lower densities on Swan River State Forest due to the occurrence of habitat.

AGE CLASS

In general, age classes of stands increased through time, resulting in older stands with less stands in the regeneration age class. This trend does not hold true for the ponderosa pine or western larch/Douglas-fir cover types, where many acres were either harvested or had progressed into the mixed-conifer cover type due to the lack of disturbance. Species that use ponderosa pine and/or western larch for feeding and/or reproduction, such as sapsuckers, probably declined on Swan River State Forest due to the loss of habitat. In the longer term, the stands in the 0-to-39-year age class would mature

and increase these types of habitats. In stands where the lack of disturbance allowed conversion to mixed conifer, habitat for these species is expected to decrease in the long-term.

Presently, Swan River State Forest supports more 150-year-old-or-older stands than was recorded in the 1930s. However, most of this 150+-year stands are in the mixed-conifer, western white pine, and subalpine fir cover types. The western white pine cover type may be misleading because much of the western white pine died out and/or was salvaged from these stands. Also, the classification of cover types tends to favor western white pine. The 150+-year-old western white pine support a variety of species, depending on the other tree species present. The subalpine fir and mixed-conifer cover types characteristically consist of dense-canopied forests, supporting species such as pine marten. Older stands dominated by shade-intolerant tree species (western larch, ponderosa pine), which typically grew in open-canopied stands, declined from historic levels. The decrease in these habitats reduced habitat for species such as pileated woodpeckers.

OLD-GROWTH NETWORK

An old-growth network was developed for Swan River State Forest. The network reflects the management strategies of Swan River State Forest to implement the 1998 Biodiversity Guidance as set forth in the SFLMP. The old-growth network was only meant as a management tool and consisted of stands that were 150 years or older. Some of these stands do not meet the Green et al old-growth definition. None of the areas proposed for harvesting are included in the Old-Growth Network. However, several stands less than 150 years old that are important for connectivity are designated as "mature glue" and would be partially harvested. Under Action Alternative E, 1 stand designated as

"recruitment old growth" would be partially harvested.

DIRECT EFFECTS TO COARSE FILTER

- ***Direct Effects of No Action, Alternative I***

No additional displacement or disturbance of wildlife is expected in the area.

- ***Direct Effects of Action, Alternatives B, C, D, E, and F***

Displacement and/or disturbance are expected for wildlife species in the area; however, the extent of disruption is unknown and related to the species in question. Generally, the amount of harvest area and its associated roads provides an avenue to develop a hierarchy of potential disturbance to wildlife in the area. Therefore, Action Alternatives B, F, C, E, and D are expected to provide the lowest to highest amount of disruption to wildlife in the area, respectively.

INDIRECT EFFECTS TO COARSE FILTER

Cover Types and Age Class

- ***Indirect Effects of No Action, Alternative I***

Stands would continue to age and convert to mixed-conifer cover types. These stands would maintain or increase their canopy closure, shading out understory plants and shade-intolerant seedling trees. In the long-term, wildlife species that use more open stands and/or shade-intolerant tree species, such as many cavity-nesting species, would lose habitat, while wildlife species that use a late-successional forest structure, such as pine marten, would benefit from an increase in habitat.

- ***Indirect Effects of Action, Alternative B***

The proposed harvests would convert 80 acres of mature (18 acres) and old-growth (62 acres [Green et al]) mixed conifer to regenerating western white pine. An additional 112 acres of Green et al old-growth and 56 acres of mature western white pine and 65 acres of mature mixed-conifer stands would be harvested, but the cover type would be retained while the age class would be converted to the 0-to-39-year age class. This alternative would remove forested habitats for a long period of time. In the short-term, early successional species, such as mountain bluebirds, would benefit from these harvests. However, forest-dwelling species that rely on a forested structure, such as pine martens, would lose habitat for a long period of time until these characteristics once again develop in the stand. In the distant future, regenerated shade-intolerant tree species would be available for cavity-nesting species.

- ***Indirect Effects Common to Action Alternatives C and D***

Conversions from the mixed-conifer and lodgepole pine cover types to the western larch/Douglas-fir cover type would occur. Under Action Alternative C, 18 acres of the mixed-conifer cover type would be converted to western white pine, and fewer acres would be converted to a western larch/Douglas-fir cover type as compared to Action Alternative D. The conversions would not change the age class of the stands. The effects of Action Alternatives C and D are similar to Action Alternative B, except the benefits for early successional species would not be realized, and the benefits expected in the longer-term would occur in the short-

term. Additionally, the remaining trees in the harvested stands are expected to increase their growth rate; thereby, the remaining trees would obtain larger sizes than under No-Action Alternative A or Action Alternative B, thereby benefiting cavity-nesting species in the nearer future.

- ***Indirect Effects of Action Alternative E***

This alternative combines the effects of the Action Alternatives B, C, and D. The effects discussed under Alternative B are expected on 93 acres (53 Green et al old growth and 40 acres of mature stands), while the effects discussed under Action Alternatives C and D are expected on the remaining acres.

- ***Indirect Effects of Action Alternative F***

This alternative would convert 11 acres of mature mixed conifer to regenerating mixed conifer. An additional 18 acres of mature mixed conifer would be regenerated to western white pine. Otherwise, the proposed harvests would not alter the age class, but would increase the amount of shade-intolerant cover types. The effects of this alternative are similar to Action Alternative B, except the benefits for early successional species would not be realized and the benefits expected in the longer term would occur in the short term. Additionally, the remaining trees in the harvested stands are expected to increase their growth rate; thereby, the remaining trees would obtain larger sizes than under No-Action Alternative A or Action Alternative B, thereby benefiting cavity-nesting species in the nearer future.

CUMULATIVE EFFECTS TO THE COARSE FILTER

Cover Type and Age Class

- ***Cumulative Effects of No-Action Alternative A***

Cover types would continue to convert from shade intolerant to shade tolerant, and age classes would continue to increase. This situation would affect wildlife species using the area by decreasing habitat diversity in the area and favoring species associated with late-succession, shade-tolerant habitats, such as pine marten, at the expense of wildlife species that rely on shade-intolerant tree species, such as many cavity-nesting species.

- ***Cumulative Effects of Action Alternative B***

Conversion would occur through regeneration harvests that would more closely reflect the historic cover types; however, this alternative would move the western larch/Douglas-fir age-class distribution further away from historic conditions. This alternative would benefit early successional species, such as mountain bluebirds, at the expense of mid- to late-successional species, such as hairy woodpeckers. In the distant future, the cover types and age classes would more closely reflect historic conditions.

- ***Cumulative Effects of Action Alternatives C and D***

Conversion from the mixed-conifer cover type to the western larch/Douglas-fir cover type would move Swan River State Forest toward historic conditions. Action Alternative D converts 89 more acres than Action Alternative C. These conversions would not alter the age-class distribution.

Therefore, these alternatives would move the vegetation of Swan River State Forest toward historic conditions. Additionally, the treatments are expected to increase tree growth, thereby decreasing the amount of time before old-growth characteristics develop. These alternatives are expected to benefit native wildlife species by reproducing habitats to which the species are adapted.

- ***Cumulative Effects of Action Alternatives E***

This alternative combines the effects of Action Alternatives B, C, and D. The effects discussed under Action Alternative B apply to 93 acres; while the effects discussed under Action Alternatives C and D apply to the remaining area.

- ***Cumulative Effects of Action Alternatives F***

Conversion from mixed conifer to western larch/Douglas-fir, western white pine, and lodgepole pine would move Swan River State Forest toward historic conditions. These conversions would not alter the age-class distribution, except on 29 acres, where regeneration would occur. Therefore, these action alternatives move the vegetation of Swan River State Forest toward historic conditions. Additionally, the treatments are expected to increase tree growth, thereby decreasing the amount of time before old-growth characteristics develop. This action alternative is expected to benefit native wildlife species by reproducing habitats to which the species are adapted.

Old-Growth Network

- ***Cumulative Effects of No-Action Alternative J***

No part of the Old-Growth Network would be altered. Timber stands would continue to age and convert to the mixed-conifer cover type. The amount of late-successional, dense old growth would be increased.

- ***Cumulative Effects of Action Alternative B***

Stands 14-08, 11, and 27, designated as "mature glue", would be regenerated. Following treatment, these stands would not function to retain connectivity to the old-growth network. These stands are on the exterior of the old-growth network. Seedtree harvests would reduce the interior habitat of the old-growth network, increase edge (amount and abruptness of habitat change), and reduce connectivity of the network.

- ***Cumulative Effects of Action Alternatives C, D, and F***

Designated as "mature glue", Stands 22-09, 16, 28-04, 10, and 11 under Action Alternatives C and F would be commercially thinned. Under Action Alternative D, the stands mentioned above plus 22-08 would be commercially thinned. This type of treatment is not expected to detract from the function of these stands, but might enhance their function by increasing the growth of residual trees.

- ***Cumulative Effects of Action Alternatives E***

Stands 14-13; 22-09, 16, 28-04, and 11, designated as "mature glue," and Stand 22-17, designated "recruitment old growth", would be commercially thinned. The effects would be similar to Action Alternatives C and D.

FINE-FILTER ASSESSMENT

On any particular piece of ground, individual species that are recognized to be of special concern are evaluated (a "fine-filter analysis"); those species are addressed below and include wildlife species Federally listed as "threatened" or "endangered", species listed as "sensitive" by DNRC, and species managed as "big game" by DFWP. We would manage to maintain rare or unique habitats and make reasonable attempts to pursue cooperative planning with major adjacent landowners (DNRC 1996).

THREATENED AND ENDANGERED SPECIES

Four species indigenous to northwestern Montana are classified as "threatened" or "endangered" under the Endangered Species Act of 1973. The bald eagle, Canada lynx, and grizzly bear are listed as "threatened", while the Northern Rocky Mountain wolf is listed as "endangered".

➤ Bald Eagle

Existing Condition

The bald eagle is classified as "threatened" and is protected under the Endangered Species Act. Strategies to protect the bald eagle are outlined in the *Pacific States Bald Eagle Recovery Plan* (U.S. Fish and Wildlife Service 1986) and the *Montana Bald Eagle Management Plan* (Montana Bald Eagle Working Group 1994). Management direction involves identifying and protecting nesting, feeding, perching, roosting, and wintering/migration areas (USFWS 1986, Montana Bald Eagle Working Group 1994).



Bald eagles prefer multistoried nesting habitats with 40 to 70 percent canopy cover and emergent trees within topographic line-of-sight to an associated water source with an adequate food supply. The emergent trees and/or snags need to be large enough (larger than 25 inches dbh) to support nesting or perching eagles. Additionally, eagles prefer cottonwood, Douglas-fir, and ponderosa pine trees (Wright and Escano 1986). In western Montana, eagles also use western larch and Engelmann spruce.

The project area is not within any known bald eagle territory. Although the project area does not contain a bald eagle territory, some potential habitat exists in the northeast portion of the project. Using the suitability-assessment process outlined in the *Montana Bald Eagle Working Group* (1991), several stands that might provide habitat were evaluated.

The northeast corner of the project area abuts Swan River; approximately 1 mile south is Metcalf Lake. Both bodies of water might provide eagles with foraging opportunities. All the stands in Section 12 and Stand 20 in Section 2 are within 1 mile and in the line of Swan River; therefore, these stands might provide bald eagle habitat. Stands 12-05, 06, and 15 provide desirable physical characteristics (location, elevation, slope), desirable large tree species (Douglas-fir, western larch, Engelmann spruce), and contain a dense canopy closure of more than 70 percent, but are located near a well-used open road. Harvesting is proposed only in Stand 12-06. Other stands in the section provide some beneficial habitat components, but their physical components are less desirable. Presently, these habitats are unoccupied.

Timber harvesting can affect bald eagles and their habitat directly by road use and harvesting disturbance, and indirectly by altering the number, species, and distribution of large snags, large trees, visual screening, and changing canopy coverage.

Since this area is currently unoccupied, no cumulative-effects analysis area is defined.

Therefore, any change at the local area would similarly contribute to the overall landscape. Presently, habitat quality in the area is limited by road disturbance and salvage and firewood harvesting along Lower Whitetail Road.

Direct Effects to Bald Eagles

Under all alternatives, no direct effects would occur because the project area is outside of any bald eagle home ranges.

Indirect Effects to Bald Eagles

- Indirect Effects Common to No-Action Alternative A and Action Alternatives D and F***

No harvesting would occur in potential eagle habitat. The number of snags, large trees, and species mix would remain unchanged in the short-term. In the long-term, shade-tolerant tree species (grand-fir, Engelmann spruce) would increase and shade-intolerant species (western larch, Douglas-fir, western white pine) would decrease. Desirable trees, such as western larch and Douglas-fir, would eventually die out of the stand. Tree growth and mortality would continue at a similar rate. Canopy cover would continue to increase and emergent trees would decline. Salvage operations and firewood cutting along open roads would continue, removing structure needed by bald eagles. Barring

any natural disturbance, No-Action Alternative A would retain moderate-quality potential habitat in the short-term, but habitat quality would decline in the future, resulting in limited potential for increased bald eagle breeding territories in the area.

- Indirect Effects of Action Alternative B***

Harvesting would alter 136 acres of potential habitat. The prescription calls for seedtree harvests in these stands, leaving a scattered overstory (10 to 15 percent canopy cover) of primarily dominant, shade-intolerant species, such as western larch, western white pine, and Douglas-fir. Retention of western larch, Douglas-fir, and western white pine would provide bald eagles with nest and perch trees. Although the number of these trees would be reduced, the dominant trees would be retained and would benefit from reduced competition. The leave trees would most likely be trees that would be used by eagles for nesting and perching.

Approximately 4 snags and live trees per acre would be retained. Some reduction in nesting and perching trees is expected due to the reduction of snags. The planned seedtree harvests would reduce the heavy overstory canopy (more than 70 percent) to a scattered overstory (10 to 15 percent), thereby increasing habitat quality (*Montana Bald Eagle Working Group 1991*). The reduction in canopy cover would result in a short-term increase in the quality of nesting habitat, resulting in the possible expansion of the bald eagle population. In the longer term, the seedtree harvests (assuming the seedtrees are left on site) would produce emergent

trees over a more-open canopy; therefore, in the short term, some small change in the quality of eagle habitat is expected from Action Alternative B. In the longer term, bald eagle habitat quality might increase; however, the location and use of the roads in the area might offset any short-term or long-term beneficial changes in habitat quality. The retention of a 100-foot visual-screening buffer along these roads might reduce the impacts of these roads to some degree; although, in Stands 02-20, 12-10, and 12-11, cable logging would occur that might substantially decrease the amount of visual buffer retained along the open road. Action Alternative B is expected to result in a slight net increase in bald eagle habitat quality; however, these increases would be offset by the open-road impacts, resulting in negligible effects to bald eagles.

- ***Indirect Effects of Actions Alternatives C and E***

Stand 12-06 would be harvested using a commercial-thin harvest prescription. The commercial-thin prescription would focus on retaining dominant seral species (western larch, Douglas-fir, western white pine). These alternatives would retain more large trees and snags, while reducing the overstory canopy to 40 to 60 percent. The road impacts and mitigation measures are the same as Action Alternative B. Action Alternatives C and E are expected to result in a net increase in bald eagle habitat quality (more than Action Alternative B); however, these increases would be offset by the open-road impacts, resulting in negligible effects to bald eagles.

Cumulative Effects to Bald Eagle

Since no bald eagle breeding territory includes the project area, the cumulative effects are the same as the indirect effects displayed above.

➤ Canada Lynx

Existing Condition

Canada lynx are listed as "threatened" under the Endangered Species Act. Currently, no recovery plan exists.



DNRC developed lynx guidance associated with the SFLMP, where lynx was listed as a sensitive species. With the Federal listing and new information, DNRC guidance needs to be updated. This guidance is in the development stage; therefore, DNRC is updating this guidance to reflect the new information.

Several reports have been written to summarize the research on lynx and develop a conservation strategy (Ruediger et al 2000, Ruggiero et al. 2000). FNF used the guidelines in Ruediger et al. (2000) to define lynx analysis units and model suitable habitat (FNF 2000). The guidelines suggested in these publications and the mapping efforts conducted by FNF have not been officially adopted by DNRC. This information was, however, used to conduct this analysis.

Lynx are associated with subalpine fir forests generally between 4,000 and 7,000 feet in elevation in western Montana (Ruediger et. al 2000). Lynx habitat in the western mountains consists primarily of coniferous forest with plentiful snowshoe hares, mature forests for

denning and cover for kittens, and densely forested cover for travel and security. Additionally, the mature forests provide habitat for red squirrels, an alternative prey source.

Approximately 83 percent of the project area occurs in suitable habitat (FNF 2000). Upon further refinement based on aerial photos and field surveys, the percentage of suitable habitat drops to 77 percent. On DNRC lands, potential lynx denning and snowshoe hare (high-quality foraging) habitats were defined using the SLI database. Field review eliminated several stands from denning habitat based on structure. Approximately 774 acres of lynx denning habitat were defined primarily in Sections 16, 30, and 32. Foraging habitat occurs in a variety of areas in the project area. Many stands on DNRC and Plum Creek Timber Company lands were previously harvested using regeneration harvests. In many of these units, regeneration is well established and providing snowshoe hare habitat. Most of the proposed harvest units fall within suitable lynx habitat; however, no harvesting is proposed in denning habitat. Road management, canopy-cover reduction, tree regeneration, and alteration of the amount and size of coarse woody debris could alter lynx habitat in the project area and in the Lynx Analysis Unit (LAU).

Cumulative effects were analyzed for the Woodward LAU. This analysis unit approximates the home range of an adult female lynx. Presently, approximately 64.5 percent of this analysis unit is suitable lynx habitat based on the Flathead Forest Analysis (FNF 2000) and refinement discussed above. Most of the unsuitable habitat is due to topographic, not habitat, constraints. Many activities occurred in this

LAU that might affect lynx habitat. Past and continued salvage and regeneration harvests on DNRC and Plum Creek Timber Company lands removed denning habitat (current and future) and/or might have disrupted travel corridors. Additionally, regeneration harvests alter foraging habitat. Additionally, salvage harvesting on both DNRC and private lands removed current and future denning structure.

Direct Effects to Canada Lynx

- Direct Effects Common to All Alternatives**

Under all alternatives, no substantial direct effects are expected. A slight potential increase for mortality is possible due to road traffic on gated and/or new roads. However, this risk factor is expected to be extremely small. Lynx do not appear to avoid roads at low-traffic volumes, so increased logging traffic on open and gated roads is not expected to displace or increase the energetic cost of individual lynx. This might not be the case if a den site occurs near a haul route. The increased traffic/disturbance might result in increased energetic costs to the female and/or increased mortality of kittens because the female might move her kittens from a secure den to an alternative den (Ruggiero et al. 2000). These risks increase with the amount of roads used; therefore, No-Action Alternative A and Action Alternatives B, F, C, E, and D would present the least to the most risk, respectively, to adversely affect lynx. However, no alternatives enter or pass through areas believed to be high-quality denning habitat; therefore, the risks are very minor.

Indirect Effects to Canada Lynx

- ***Indirect Effects of No-Action Alternative A***

Canada lynx would continue to use the project area similarly in the short-term. In the longer-term, barring disturbance, stands would continue to age and increase in the coarse woody debris needed for denning and security cover. Regenerating harvest units would mature and reduce habitat for snowshoe hares, resulting in decreased primary-prey availability for lynx. As these stands matured, habitat for red squirrels would increase, somewhat lessening the loss of prey. However, a diet of red squirrels might not provide the nutrients needed for successful reproduction and rearing of kittens (Koehler 1990). Therefore, in the short-term, no effects to Canada lynx are expected. In the longer term, without disturbance, denning habitat is expected to increase, but foraging opportunities are expected to decrease, resulting in a reduced potential for lynx reproduction.

- ***Indirect Effects of Action Alternative B***

Under this alternative, 156 acres of suitable habitat would

be converted to unsuitable by seedtree harvests, and no new roads would be constructed in suitable habitat (TABLE F-1 - SUMMARY OF LYNX HABITAT MODIFIED UNDER EACH ALTERNATIVE). The habitat that would be affected occurs on the edge of suitable habitat and furthest away from high-quality denning habitat. Furthermore, these stands are below the elevation gradients typically used by lynx in the Seeley-Swan study area (Squires 2000). The conversion of these stands would reduce red squirrel foraging opportunities. Denning habitat is not expected in these stands; therefore, no change in the amount of denning habitat is expected. In the long-term, these stands would regenerate to provide snowshoe hare habitat, resulting in some offsetting of foraging habitat loss due to succession. The short-term and long-term effects of Action Alternative B are expected to be negligible due to the marginal quality of the habitat.

- ***Indirect Effects of Action Alternative C***

Under this alternative, 353 acres of suitable habitat would be modified using a commercial-thin prescription, and 1.28 miles of new road would be built in suitable habitat (TABLE F-1 - SUMMARY OF LYNX HABITAT MODIFIED

TABLE F-1 - SUMMARY OF LYNX HABITAT MODIFIED UNDER EACH ALTERNATIVE

ALTERNATIVE	ACRES OF SUITABLE HABITAT MODIFIED	ACRES OF SUITABLE HABITAT REMOVED	PERCENT SUITABLE HABITAT REMAINING	ACRES OF DENNING HABITAT RETAINED ON DNRC	MILES OF ROAD CONSTRUCTION IN SUITABLE HABITAT	ACRES OF HABITAT LOST TO ROAD RIGHT-OF-WAY
A	0	0	65.2	774	0	0
B	156	156	63.7	774	0	0
C	353	0	65.2	774	1.28	6.2
D	471	0	65.2	774	3.92	19.0
E	488	71	64.2	774	2.44	11.9
F	279	18	64.5	774	0.7	3.4

UNDER EACH ALTERNATIVE). Three of the stands proposed for harvesting are old growth, though none appear to provide quality denning habitat. Stand 26-25 provides thick understory cedar, which might provide snowshoe hare habitat. Harvesting in this stand would decrease hare habitat by removing or trampling the present regeneration; however, patches of regeneration would be retained. Old-growth and mature stands with thick understory (horizontal cover) provide stable habitat for snowshoe hares and red squirrels. Conversely, regenerating stands provide higher quality habitat, but this habitat is relatively short-lived (Buskirk et al. 2000). The other stands proposed for harvesting are in the 40-to-99-year or 100-to-old-growth age-class category. These stands probably do not provide substantial snowshoe habitat; however, these stands probably provide red squirrel habitat. Research indicates that red squirrel populations decline with the removal of cone-producing trees (Pearson 1999). All of the proposed commercial-thin units would result in decreased red squirrel foods (seeds), resulting in reduced squirrel population and Canada lynx foraging opportunities. The commercial-thin prescription is expected to increase the growth rates of retention trees, reducing the time needed before these trees might provide denning habitat. In the short term, Action Alternative C is expected to not alter denning habitat and reduce snowshoe hare and red squirrel habitat (foraging) in stands entered (392 acres) to an unknown degree; however, no unit would be converted to an unsuitable condition or prevent Canada lynx movement. In the

long term, Action Alternative C might increase the potential for denning in the entered stands in a shorter period of time. The outcome of these effects might be no change or some habitat shifts to compensate for prey availability, but no substantial effects to resident Canada lynx are expected.

Action Alternative C also proposes to build 2.76 miles of new road. Of the 2.76 miles proposed, 1.28 miles of new road would be built in suitable Canada lynx habitat. Canada lynx do not appear to avoid roads or human activity (Ruggiero 2000a). However, new road construction removes habitat and might result in increased competition from other predators. In some cases, lynx will use roads to travel and hunt (Koehler and Brittell 1990). If these units are harvested during the winter, other predators could use the cleared roads and/or the packed skid trails to access key lynx foraging areas. This situation could be perpetuated by recreational snowmobiling, and, to a much lesser degree, skiing on the new roads. The increased competition might lead to decreased survival of lynx. Additionally, the roads would allow better access to the area for trappers, which might result in increased trap mortality. The proposed new roads in suitable habitat extend off existing roads and range from a length of 0.17 to 0.32 miles. These new roads remove 6.2 acres of habitat (making these acres unsuitable), but do not substantially increase the amount of area accessible to competing predators or trappers. Most of these acres would be included in harvest units and might, if they are allowed to regenerate, benefit lynx in the

long-term by increasing diversity and edge within the harvest unit. The road systems containing the new road construction would be gated following use. These newly constructed roads are not expected to result in any measurable effects to lynx.

- ***Indirect Effects of Action Alternative D***

The effects would be similar to Action Alternative C, except more acreage (471 acres) would be harvested. None of the harvest units would be located in old growth and more road (3.92 miles) would be constructed in suitable habitat, resulting in a 19-acre loss of habitat (*TABLE F-1 - SUMMARY OF LYNX HABITAT MODIFIED UNDER EACH ALTERNATIVE*). Since more acres, but no old growth, would be harvested, more impacts are expected to red squirrels, while the habitat for its primary prey, snowshoe hares, would remain unchanged. The additional road would increase the risks of mortality by competition and/or trapping. Therefore, fewer effects on lynx foraging habitat are expected than under Alternative C; however, the risk of mortality increases.

- ***Indirect Effects of Action Alternative E***

Similar effects to Action Alternative B in the seedtree harvests (71 acres) and to Action Alternative C in the commercial-thin treatments (417 acres) are expected with this alternative. The road effects would be similar to Action Alternative D, except fewer roads (2.44 miles) are proposed in suitable habitat, resulting in a loss of 11.9 acres of habitat (*TABLE F-1 - SUMMARY OF LYNX HABITAT MODIFIED UNDER EACH*

ALTERNATIVE) ; however, the roads access more country. Action Alternative E is expected to not alter denning habitat, to remove 71 acres of foraging habitat, and reduce lynx foraging habitat quality in commercial-thin stands (417 acres) to an unknown degree. The road portion of Action Alternative E is expected to produce the highest risk (compared to Action Alternatives B, C, D, and F) of mortality to lynx.

- ***Indirect Effects of Action Alternative F***

The effects would be similar to Action Alternative C, except 18 acres of habitat would be converted to unsuitable for a period of time using a seedtree harvest and 261 acres of suitable habitat would be modified using a commercial-thin prescription. Additionally, 0.7 miles of road would be built in suitable habitat. Stand 26-25 would not be harvested under this alternative; therefore, no changes in snowshoe habitat are expected in the short-term. In the longer-term, 18 acres of snowshoe hare habitat would develop in stand 26-20. Because this stand lies near an open road and at the lower extent of lynx habitat, the increase in hare habitat is not expected to benefit lynx appreciably. The effects of this alternative are not expected to substantially increase trapper and/or competitors access of lynx habitat, create barriers to lynx movement, substantially change prey availability, or alter denning habitat in the short-term. The proposed treatments might increase the rate of denning-habitat development.

Cumulative Effects to Lynx

- **Cumulative Effects Common to No Action Alternative, Land Action Alternatives C, D, and F**

Under No-Action Alternative A, no suitable habitat would be lost in the LAU. Under Action Alternatives C, D and F, less than 19 acres of suitable habitat would be lost in the LAU (TABLE F-1 - SUMMARY OF LYNX HABITAT MODIFIED UNDER EACH ALTERNATIVE).

- **Cumulative Effects Common to Action Alternatives B and E**

Under Alternative B, 156 acres of the LAU would be lost, resulting in 63.7 percent of remaining suitable habitat; under Alternative E, 71 acres of the LAU would be lost, resulting in 64.2 percent of remaining suitable habitat (TABLE F-1 - SUMMARY OF LYNX HABITAT MODIFIED UNDER EACH ALTERNATIVE). The loss of suitable habitat would be negligible and would not result in detrimental effects to lynx using the area. Since a majority (97.2 percent) of suitable habitat in the LAU exists in the project area, the cumulative effects of the proposed roads are the same as described under DIRECT EFFECTS and INDIRECT EFFECTS.

in grizzly bear habitat in the Northern Continental Divide Ecosystem (NCDE) recovery area. The NCDE is divided into subunits. Each subunit approximates the size of the home range of a female bear and is separated from other subunits based on topography. This project is proposed in the Porcupine-Woodward Subunit. The SVGBCA applies to this project. This Porcupine-Woodward Subunit is open for harvesting during the non-denning period in the years of 2000 through 2002 under SVGBCA. SVGBCA directs land managers to:

- maintain more than 40 percent hiding cover,
- have no point of an opening further than 600 feet from cover,
- provide at least 100 feet of visual screening buffer along open roads adjacent to regeneration units (acceptable exceptions to this might occur along cable logging units), and
- maintain less than 33 percent of each subunit in road densities more than 1 mile per square mile.

No total-road-density agreements for DNRC were outlined in SVGBCA. Adherence to the guidelines documented in SVGBCA is expected to reduce the possibility of the incidental take of grizzly bears. The project area provides year-round habitat for grizzly bears. During the spring, bears search for winter-killed big game and lush green vegetation. During the summer, bears seek lush green vegetation that is typically found in riparian areas. In the late summer and into the autumn, bears switch to primarily a berry diet. The project area varies from low elevation in a big game winter range containing meadows and

➤ Grizzly Bear

Existing Condition

Grizzly bears are listed as "threatened" under the Endangered Species Act. The Grizzly Bear Recovery Plan defines 6 recovery areas (USFWS 1993). This project is proposed



cutting units, which provide vegetative food sources, to alpine areas. Presumably, big game carcasses are available, at least in the spring. The project area may also provide birthing habitat for big game, which provides a source of prey for bears in late spring. The mid and upper elevations provide summer and autumn habitat. This project may effect grizzly bears directly through increased road traffic, noise, and human activity indicated by changes in road densities. Indirectly they may be affected by altering the amount and location of hiding cover and forage resources.

On State trust lands in the project area, 5,271 acres (83.2 percent) provide hiding cover. The need for hiding cover increases as motorized access/human disturbance increase. Human disturbance in the project area away from open roads is low and most of the roads that access the project area are gated and used only for administrative use.

The cumulative-effects analysis was conducted using the Porcupine-Woodward Subunit, which approximates the size of the home range of an adult female bear. The Porcupine-Woodward Subunit is comprised of approximately 37,715 acres (58.9 square miles), with 15,524 acres (41.0 percent) managed by FNF, 12,247 acres (32.5 percent) managed by DNRC, and 8,659 acres (23.0 percent) managed by Plum Creek Timber Company; 1,229 acres (3.4 percent) are privately owned.

Hiding cover in the Porcupine-Woodward Subunit was reduced by past timber harvests. Hiding cover is believed to become limiting when it drops below 40 percent of the subunit. Presently, the subunit contains approximately 29,481 acres (78.2

percent) of hiding cover, of which 9,063 acres (74 percent) occurs on State trust lands (Gilbert et al., 2000.). Hiding cover is unknown on small private lands and was assumed to be absent in this analysis; therefore, the 78.2 percent of hiding cover in the subunit is a conservative estimate.

Access management is a major factor in managing grizzly bear habitat. The project area is accessed by 5 open roads, which primarily run along creek courses. Many other restricted roads split off these open roads. A moving-windows analysis (Ake 1994) done with recent road data indicates that the Porcupine-Woodward Subunit contains 31 percent of the subunit in excess of 1 mile per square mile of open-road density. This subunit is currently above the open-road densities required in SVGBCA. Cooperators are discussing options to bring the subunit into compliance with the SVGBCA. Since the release of the DEIS, agreements were made to reduce road densities to 31 percent. DNRC has installed the needed closure devices, while Plum Creek Timber Company is scheduled to do so in August. Managing motorized access reduces the potential for mortality, displacement from important habitats, habituation to humans, and provides relatively secure habitat to reduce the energetic requirements (IGBC 1998).

Direct Effects to Grizzly Bears

• Direct Effects Common to All Alternatives

Under No-Action Alternative A or Action Alternatives B, C, D, E, and F, if conducted in the denning period, no increased disturbance to grizzly bears is expected.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F***

Temporary disturbance to grizzly bears is expected if any timber is harvested or hauled during the nondenning season. Activities in occupied grizzly bear habitat reduce bear security, possibly resulting in increased stress and/or energy expenditure to endure the disturbance or move from the area. The adjacent subunits are closed to harvesting activities during this time period. Therefore, if disturbance displaces bears from the subunit, areas of relatively undisturbed habitats are available nearby. Conflicts between resident bears and displaced bears in the adjacent subunits are not expected. Mace and Waller (1997) found that female bears tolerated other male and female bears using their home range, although some local aggressive behaviors did occur between an adult male and young male and female. Therefore, the effects of No-Action Alternative A would not present any increased risk to grizzly bears, while the effects of Action Alternatives B, C, D, E, and F (in the nondenning period) would present a very minimal risk to grizzly bears. The higher the percentage of the subunit exceeding 1 mile per square mile of open-road density, the more relative the risk would occur. Therefore, the alternatives with more disturbance would occur under D, E, C, F, and B, respectively.

The season of disturbance is important in addressing the impacts to grizzly bears. Winter harvesting would probably result in no direct effects to bears unless these activities occurred around a den site, which could possibly cause a

bear to abandon its den. This is highly unlikely under any alternative since unit locations are lower in elevation than where grizzly bears typically den. Secondarily, activities that target time periods when the probability of animals using the area is low or when animals are most resilient to disturbance would result in reduced direct disturbance to grizzly bears in the nondenning period. Therefore, because harvesting during the nondenning season would likely start in the summer period, the action alternatives are not expected to result in any measurable effects to grizzly bears. During this period, the bear has recovered from the denning season and habitat is abundant; therefore, these animals are able to travel and find new food sources with minimal effects on their survival. Although the effects are expected to be negligible, the alternatives differ in the amount of direct effects they would produce. The relative amount of disturbance/displacement effects related to the alternatives is, lowest to highest, No-Action Alternative A and Action Alternatives B, F, C, E, and D. These disturbances would only be present during harvesting operations.

Indirect Effects to Grizzly Bears

- ***Indirect Effects of No-Action Alternatives J***

Hiding cover would not be reduced. Canopy cover would not be removed; thereby, foraging opportunities for grizzly bears would not be increased.

- ***Indirect Effects Common to Action Alternatives B, C, D, E, and F***

Timber harvesting would reduce hiding cover in every unit. To

assess the highest reduction in hiding cover, hiding cover is assumed to be removed in all harvest units, although commercial-thin units would retain much more hiding cover than seedtree harvest units. Under Action Alternative B, C, D, E, and F, hiding cover in the project area would be reduced by 313, 628, 667, 570, and 514 acres, respectively (*TABLE F-2 - GRIZZLY BEAR HABITAT*

CHARACTERISTICS ALTERED BY ALTERNATIVE). Hiding cover is especially important along roads and in areas that receive human disturbance. A 100-foot buffer along open roads would be retained in all harvest units, except where cable logging occurs, under Action Alternatives B, E, and F; at no point within the seedtree harvest units would it be over 600 feet to cover. Hiding cover in these harvested units is expected to regenerate in approximately 25 years. Since hiding cover is not limiting in the area, these losses are expected to result in negligible effects to grizzly bears.

Following treatment, reducing canopy cover and burning might stimulate berry-producing plants

and other forage (Marten 1979, Zager 1980). However, mechanical scarification or a hot fire may reduce the response of berry-producing plants (Zager 1980). In large patches of berry-producing plants, attempts would be made to avoid these patches or minimize damage to the vegetative organs when mechanically scarifying the area. The increased forage would be approximately proportional to canopy removal. Therefore, forage increases are expected to be higher in Action Alternatives B, E, F, D, and C, respectively. The increased forage resulting from Action Alternative B would probably be offset by the proximity to open roads. The effects of all the action alternatives would be minor.

Cumulative Effects to Grizzly Bears

- *Cumulative Effects of No-Action Alternative A*

Under No-Action Alternative A, motorized access to the area would remain unchanged. Forest succession would continue and may reduce food sources for grizzly bears, but increase the

TABLE F-2 - GRIZZLY BEAR HABITAT CHARACTERISTICS ALTERED BY ALTERNATIVE

ALTERNATIVE	HIDING COVER REMOVED (ACRES)*	PERCENT OF HIDING COVER REMAINING IN SUBUNIT	PREFERRED HABITAT PROPOSED ACRES		PERCENT OF SUBUNIT EXCEEDING 1 MILE PER SQUARE MILE OF OPEN-ROAD DENSITY	
			EVEN-AGED	UNEVEN-AGED	DURING PROJECT ACTIVITIES	FOLLOWING PROJECT ACTIVITIES
A	0	78.2	16	0	31	31
B	313	77.3	0	27	42	31
C	628	76.5	0	13	46	31
D	667	76.4	0	13	47	31
E	570	76.6	0	0	45	31
F	514	76.8	0	13	46	31

* Hiding cover was assumed removed in all harvest units. However, commercial-thin treatments would retain some hiding cover; therefore, the losses in Action Alternatives C, D, E, and F are overestimates of hiding cover losses.

amount of hiding cover. Since hiding cover does not appear limiting in the subunit, maintaining this cover at the expense of food resources might reduce the quality of foraging habitat for grizzly bears in the subunit through time. Approximately 78.2 percent of the subunit would be maintained in hiding cover.

- **Cumulative Effects of Action Alternatives B, C, D, E, and F'**

Under Action Alternatives B, C, D, E, and F, approximately 77.3, 76.5, 76.4, 76.6, and 76.8 percent of the subunit would be maintained in hiding cover, respectively (TABLE F-2 - GRIZZLY BEAR HABITAT CHARACTERISTICS ALTERED BY ALTERNATIVE). Since all the estimates are well above 40 percent, no measurable effects to grizzly bear are expected.

Impacts to grizzly bears are realized when open-road density exceeds 1 mile per square mile (Mace 1997). Under Action Alternatives B, C, D, E, and F, the open-road density would increase while the project is active and would return to the existing condition after completion. Under Action Alternatives B, C, D, E, and F, the open-road density (the percent of area in the subunit that exceeds 1 mile per square mile) increases from 31 percent to 42, 46, 47, 45, and 46 percent, respectively (TABLE F-2 - GRIZZLY BEAR HABITAT CHARACTERISTICS ALTERED BY ALTERNATIVE). During the project, the direct effects discussed above might also occur in the cumulative-effects area. Harvesting activities on Plum Creek Timber Company lands in the subunit increases these effects. As discussed above, other areas are available for

bears; therefore, the effects of all of the action alternatives discussed above are expected at the subunit scale.

➤ Northern Rocky Mountain Wolf

Existing Conditions

The Northern Rocky Mountain Wolf is listed as "endangered" under the Endangered Species Act.

The Northern Rocky Mountain Wolf Recovery Plan defines 3 recovery zones (USFWS 1987).



The wolf is a wide-ranging, mobile species. Adequate habitat for wolves consists of adequate vulnerable prey and minimal human disturbance, especially at den and/or rendezvous sites. The primary prey species in northwest Montana are white-tailed deer, elk, moose, and mule deer. The distribution of wolves is strongly associated with the white-tailed deer winter range. Wolves in northwest Montana typically den in late April. Wolves choose elevated areas in gentle terrain near a water source (valley bottoms), close to meadows or other openings, and near big game wintering areas for dens and rendezvous sites. Wolves are most vulnerable to human disturbance at den and rendezvous sites.

The project area contains a small portion of white-tailed deer winter range, which may provide winter prey for wolves. The topography, access to water, and proximity to the big game winter range adhere to the description of denning and/or rendezvous-site habitat. Secure habitat away from roads is another important component of wolf habitat. The open roads in the area correspond

with potential denning habitat; therefore, the potential for wolf denning in these areas is low. Otherwise, the roads into the project area are gated and restricted to administrative use, but these roads typically occur away from the winter range. Wolves might use the project area as part of their home range or be transient to the area; however, no denning habitat is expected in the project area.

For the cumulative analysis, the overlap area between 1 mile around the project (including the project area) and the white-tailed deer winter range was used. The 1-mile buffer approximates the home range of an elk during winter and encompasses, approximately, the daily average movement in the early season (approximately 1 mile) of an adult wolf from the den or rendezvous site around each section (Joslin 1966). Therefore, the cumulative-effects area would include the majority of habitat a female wolf denning on winter range would use.

The cumulative-effects area consists of 3,962 acres; most of this area occurs outside the project area. Approximately 1,857 acres (47 percent) of the acres are managed by DNRC. The remainder of the acreage is owned by Plum Creek Timber Company and a small percentage of private individuals. The cumulative effects area contains several open roads and Highway 83 lies 1 mile to the east. That wolves would den or rendezvous in this area is quite unlikely due to the amount of traffic. Past harvest units on State trust and surrounding lands provide feeding opportunities for big game species. These units are generally gentle in topography and near water, thereby providing additional potential denning habitat. For more discussion on big game effects, refer to the BIG

GAME section in this appendix. **Direct Effects to Northern Rocky Mountain Wolves**

- ***Direct Effects of No-Action Alternative 1 and Action Alternatives D and F***

Disturbance to wolves through harvesting activities or use of roads would not increase.

- ***Direct Effects of Action Alternatives B, C, and E***

Harvesting in Stand 12-06 might provide additional disturbance in the area, thereby displacing wolves, though wolves would be unlikely to use this area due to the proximity to Lower Whitetail Road. However, if a wolf den or rendezvous site is found within 1 mile of the harvest unit, consultation would be initiated with USFWS. Under any alternative, direct effects to wolves are not expected.

Indirect Effects to Northern Rocky Mountain Wolves

- ***Indirect Effects Common to No-Action Alternative 1 and Action Alternatives D and F***

Forest canopy closure would continue to decrease big game forage in the area, thereby decreasing big game and wolf use of the area.

- ***Indirect Effects Common to Action Alternatives B, C, and E***

Big game winter-range habitat would be altered by 35 acres in Stand 12-06. This unit is located along a main open road and probably would be avoided by wolves for foraging and denning. Therefore, the effects of these action alternatives would be negligible.

TABLE F-3 - LISTED SENSITIVE SPECIES FOR NWLO AND THEIR STATUS IN RELATION TO THE SOUTH WOOD TIMBER SALE PROJECT

SPECIES	DETERMINATION - BASIS
Black-backed woodpecker	No further analysis conducted - The project area contains no recently (less than 5 years) burned areas.
Boreal owl	Included - Several proposed units occur above 5,000 feet.
Coeur d'Alene Salamander	No further analysis conducted - The project area contains no moist talus or streamside talus habitat.
Columbian sharp-tailed grouse	No further analysis conducted - The project area contains no suitable grassland communities.
Common loon	No further analysis conducted - The project area contains no large lakes.
Ferruginous hawk	No further analysis conducted - The project area contains no suitable grassland communities.
Fisher	Included - The project area contains potential fisher habitat along drainages.
Flammulated owl	No further analysis conducted - The project area encompasses no dry ponderosa pine habitats.
Harlequin duck	No further analysis conducted - Harvesting would not occur in the potential habitat along Woodward Creek.
Mountain plover	No further analysis conducted - The project area contains no suitable grassland communities.
Northern bog lemming	No further analysis conducted - No sphagnum or other fen/moss mats occur in the area
Pileated woodpecker	Included - The area contains western larch/Douglas-fir and mixed-conifer habitats.
Townsend's big-eared bat	No further analysis conducted - The project area contains no caves or mine tunnels.

Cumulative Effects to Wolves

No changes in big game habitat use or population in the cumulative effects area are expected; therefore, no cumulative effects are expected under any alternative.

consideration of their needs serves as a useful "fine filter" for ensuring that the primary goal of maintaining healthy and diverse forests is met.

SENSITIVE SPECIES

When conducting forest-management activities, the SFLMP directs DNRC to give special consideration to several "sensitive" species. These species are sensitive to human activities, have special habitat requirements that may be altered by timber management, or may become listed under the Federal Endangered Species Act if management activities result in continued adverse impacts. Because sensitive species usually have specific habitat requirements,

A search of the Montana Natural Heritage database did not return any sensitive species sightings in or within 1 mile of the project area. The USFS documented pileated woodpeckers on USFS lands in the project area (LaFountain, personal communication) and calls were heard during field work on this project. The sensitive species listed in TABLE F-3 - LISTED SENSITIVE SPECIES FOR NWLO AND THEIR STATUS IN RELATION TO THE SOUTH WOOD TIMBER SALE PROJECT were considered for analysis. Each sensitive species either was included in the following analysis or was dropped from further analysis for various reasons.

➤ Boreal Owl

Existing Conditions

Boreal owls in Montana inhabit mature to old-growth forests at elevations between 5,000 and 8,000 feet. Nesting in the Rocky Mountains has been documented in subalpine forests dominated by subalpine fir and Engelmann spruce. Such forests are structurally complex and contain high densities of large trees, shrubby and open understories, and a multilayered canopy. Boreal owls are secondary cavity-nesters, using holes excavated by pileated woodpeckers and flickers. Habitat quality depends strongly on the availability of large snags and trees containing cavities suitable for nesting. Boreal owls apparently are not sensitive to human disturbance or mechanical disturbance. The effects of forest fragmentation on boreal owls have not been studied, but might not be of high importance due to the low energetic costs of travel by these owls (Hayward 1994).

The DNRC SLI database was used to categorize stands in the project area that had tree species and structural components known to be important to boreal owls. Stands were categorized as boreal owl habitat if the following criteria was met:

- above 5,000 feet in elevation,
- the average tree age in the stand is greater than 149 years,
- the canopy cover is greater than 40 percent,
- the stand is mature and exhibiting at least some signs of decadence, and



- the stand is composed of at least 50 percent subalpine fir and/or Engelmann spruce.

Using these criteria, a total of 736 acres of DNRC lands in the project area were identified as potentially providing boreal owl habitat.

The project area located above 5,000 feet in elevation was used for the cumulative-effects analysis. This 7,534-acre area provides a large enough area to support the home range for a boreal owl (Hayward 1994). Of the cumulative-effects analysis area, USFS manages 3,471 acres, Plum Creek Timber Company manages 2,226 acres, and DNRC manages 1,837 acres. Of the acres managed by DNRC, 736 acres provide boreal owl habitat. The amount of habitat on other ownerships is unknown.

Direct Effects to Boreal Owls

Direct Effects Common to All Alternatives

Boreal owls appear to tolerate human disturbances and noise (Hayward 1994); therefore, no direct effects to boreal owls are expected under any of the 6 alternatives.

Indirect Effects to Boreal Owls

• *Indirect Effects of No-Action Alternative A and Action Alternatives B, C, D, and F*

Modification in habitat might affect boreal owls. Under Alternatives A, B, C, D, and F, no owl habitat would be altered, therefore canopy closure and trees would continue to grow, resulting in additional acres of habitat through time.

• *Indirect Effects of Action Alternative E*

Modification in habitat might affect boreal owls. Under

Action Alternative E, harvesting in Stand 22-17 would result in modifying 60 acres (8.2 percent of potential habitat) and removing 3 acres (0.4 percent) of habitat in Stand 22-15 by constructing road right-of-way. Field review of both stands reveals limited habitat quality due to small tree diameters; however, the proposed harvesting would leave the stand in useable condition by retaining 40 to 60 percent of the canopy cover. Additionally, the scattered dominant trees would be retained to provide nesting structure in the short-term, while accelerating growth of the other remaining trees would provide nesting structure in the future. The boreal owl habitat is not expected to change appreciably; therefore, the effects to boreal owls are negligible. In the longer term, the quality of boreal owl habitat might increase.

Cumulative Effects to Boreal Owls

Since the project area is large enough to provide a home range for a boreal owl, the effects discussed above would be the same for cumulative effects. In addition, continued salvage on DNRC and heavy removal harvests, especially in old growth, on adjacent Plum Creek Timber Company lands would reduce the amount of habitat available. Habitat conditions on USFS lands are expected to improve over time.

internal guidance aims at protecting valuable resting habitat near riparian areas and maintaining travel corridors.

Fishers are generalist predators and use a variety of habitat types, but are disproportionately found in stands with dense canopy (Powell 1982, Johnson 1984). Fishers appear to be highly selective of resting and denning sites. In the Rocky Mountains, fishers appear to prefer late-successional coniferous forests for resting sites and use riparian areas disproportionately to their availability. Fishers tend to use areas within 155 feet of water. Such areas contain large live trees, snags, and logs, which are used for resting and denning sites and dense canopy cover, which is important for snow intercept (Jones 1991). Additionally, Heinemeyer (1993) found reintroduced fishers in northwest Montana selected elevations between 1,970 feet and 3,280 feet and avoided elevations between 3,960 feet and 5,280 feet. The elevation in the project area ranges from approximately 3,200 feet on Woodward Creek to 7,000 feet at the divide. Most of the proposed units contain dense canopy cover and fall within the elevational range found by Heinemeyer (1993). Timber harvesting and associated road construction might affect fishers by altering habitat and/or by increasing susceptibility to trapping.

➤ Fisher

Existing Condition

Fishers are listed by DNRC as a sensitive species due to their use of old-growth habitats (DNRC 1996). DNRC's



On DNRC lands in the project area, SLI data was analyzed by cover type and age class to assess potential fisher habitat (Heinemeyer and Jones 1994). DNRC lands in the project area provide an estimated 1,216 acres (19.2 percent) of preferred fisher habitat and an estimated 2,307 (36.4 percent) acres of suitable fisher habitat. Additionally,

travel corridors connect the parcels of DNRC lands. Recent regeneration harvests on Plum Creek Timber Company lands might create a barrier to fisher movement; however, adjacent lands appear to provide adequate travel corridors to bypass unsuitable units.

Trapping is a significant source of fisher mortality. Trapping pressure was responsible for the extirpation of fisher over most of their range by the 1930s. Although they again inhabit this area, populations remain vulnerable to trapping because fisher are easily caught in traps set for marten, bobcats, and coyotes. Vulnerability to trapping is highly influenced by the miles of both open and closed (snowmobiles can travel closed roads) roads (TABLE F-4 - MILES OF ROADS BY MANAGEMENT STATUS OCCURRING IN THE PROJECT AREA).

TABLE F-4 - MILES OF ROADS BY MANAGEMENT STATUS OCCURRING IN THE PROJECT AREA

MANAGEMENT STATUS	MILES OF ROAD
Bermed	6.1
Brushed in	7.5
Closed	0.2
Gated	47.7
Open	16.1
Reclaimed	19.0

The Porcupine-Woodward Grizzly Bear Subunit was used to assess cumulative effects. For a description of the subunit and ownership, refer to GRIZZLY BEAR in this analysis. Similar conditions found in the project area exist in the subunit. In the cumulative effects area, DNRC lands provide an estimated 2,388 acres (19.5 percent) of preferred fisher habitat and 3,893 acres (31.8 percent) of suitable fisher habitat. Additionally, travel corridors connect the parcels of

DNRC and USFS lands. Recent regeneration harvests on Plum Creek Timber Company lands might create a barrier to fisher movement; however, adjacent lands appear to provide adequate travel corridors to bypass unsuitable units. Continued salvage harvests on DNRC and Plum Creek Timber Company lands would continue to decrease the quality of fisher habitat, while regeneration harvests on Plum Creek Timber Company lands would remove habitat and decrease the quality of habitat in adjacent stands for some time.

Direct Effects to Fishers

- ***Direct Effects of No-Action Alternative A***
Human disturbance would not increase.
- ***Direct Effects Common to Action Alternatives B, C, D, E, and F***

Some displacement might occur; however, the effects of this displacement would be negligible.

Indirect Effects to Fishers

- ***Indirect Effects of No-Action Alternative A***
Human disturbance would remain relatively unchanged and fisher habitat would remain relatively unchanged in the short-term. In the longer-term, more resting/denning habitat would develop. Fishers would benefit from the increased habitat and would have no increase in mortality risk, resulting in a potential increase in fisher use and/or population in the area.

- ***Indirect Effects of Action, Alternative B***

Using a seedtree harvest, 232 acres of preferred habitat, 6 acres of suitable habitat, and 76 acres of travel habitat would be modified (*TABLE F-5 - SUMMARY OF FISHER HABITAT VARIABLES MODIFIED BY ALTERNATIVE*). The harvest would remove fisher habitat for a long period of time and reduce the habitat quality in the adjacent stands because fishers avoid openings (Roy Jones 1991) and are rarely detected near abrupt-edge habitat adjacent to clearcuts (Heinemeyer, unpublished). The retention of seedtrees and a minimal amount of snags would provide resting/denning structures for the future stand. Additionally, the regenerating units might provide foraging habitat (snowshoe hare habitat) in the future. A 165-foot no-harvest buffer along perennial streams and an 83-foot no-harvest buffer along intermittent streams would be retained to protect potential high-quality resting habitat and travel corridors, since fishers prefer habitats in the proximity of water and travel along streamcourses (Jones 1991, Heinemeyer 1993). If the stream braids, the main stem of the creek would receive the full buffer, but the stream

braids would only receive SMZ no-harvest buffers. Under this alternative, 0.5 miles of new road would be constructed to provide access to Sections 14, 22, 23, and 24. This road would not change access to the area; therefore, fisher vulnerability to trapping remains unchanged. Action Alternative B would reduce fisher habitat in the unit and reduce habitat quality adjacent to the units; however, habitat and travel corridors along perennial streams would allow movement through the project area. This alternative might result in shifting some fisher habitat, while not increasing the risk of mortality or creating barriers to travel through the area.

- ***Indirect Effects of Action, Alternative C***

Commercial-thin harvests would modify 18 acres of preferred habitat, 406 acres of suitable habitat, and 204 acres of travel habitat (*TABLE F-5 - SUMMARY OF FISHER HABITAT VARIABLES MODIFIED BY ALTERNATIVE*). The harvests would reduce canopy cover and snow intercept, which would reduce the habitat quality. Since the harvests would not produce openings, which fishers avoid (Roy 1991, Jones 1991), fishers would be expected to continue to use the harvest

TABLE F-5 - SUMMARY OF FISHER HABITAT VARIABLES MODIFIED BY ALTERNATIVE

ALTERNATIVE	ACRES OF HABITAT MODIFIED			MILES OF ROAD CONSTRUCTED		
	PREFERRED	SUITABLE	TRAVEL	PREFERRED	SUITABLE	TRAVEL
A	0	0	0	0	0	0
B	232	6	76	0	0	0
C	18	406	204	0.3	1.7	0.6
D	45	411	211	0.7	2.1	2.5
E	81	233	256	1.2	1.2	2.3
F	51	376	87	0.2	1.2	0.9

units, at least for travel. Additionally, since the harvest units would not create an abrupt edge, which lowers adjacent habitat quality (Heinemeyer, unpublished), adjacent habitat quality would not be reduced. The harvests would retain the dominant trees and snags that have been dead for more than 1 year, thereby retaining resting/denning structures in the stand. A 165-foot no-harvest buffer along perennial streams and an 83-foot no-harvest buffer along intermittent streams would be retained to protect potential high-quality resting habitat and travel corridors (Jones 1991, Heinemeyer 1993). If the stream braids, the main stem of the creek would receive the full buffer, but the stream braids would only receive SMZ no-harvest buffers. These buffers would be more beneficial adjacent to these commercial-thin units than the abrupt edges of regeneration harvests (Heinemeyer, unpublished). Action Alternative C would reduce the quality of fisher habitat in the harvest units in the short-term, but would retain structure for near-future habitat. The harvests would not create barriers to fisher movements, and travel corridors along perennial streams would retain movement through the project area. Therefore, some reductions in short-term habitat quality and quantity are expected by this alternative, resulting in some shifts in habitat use.

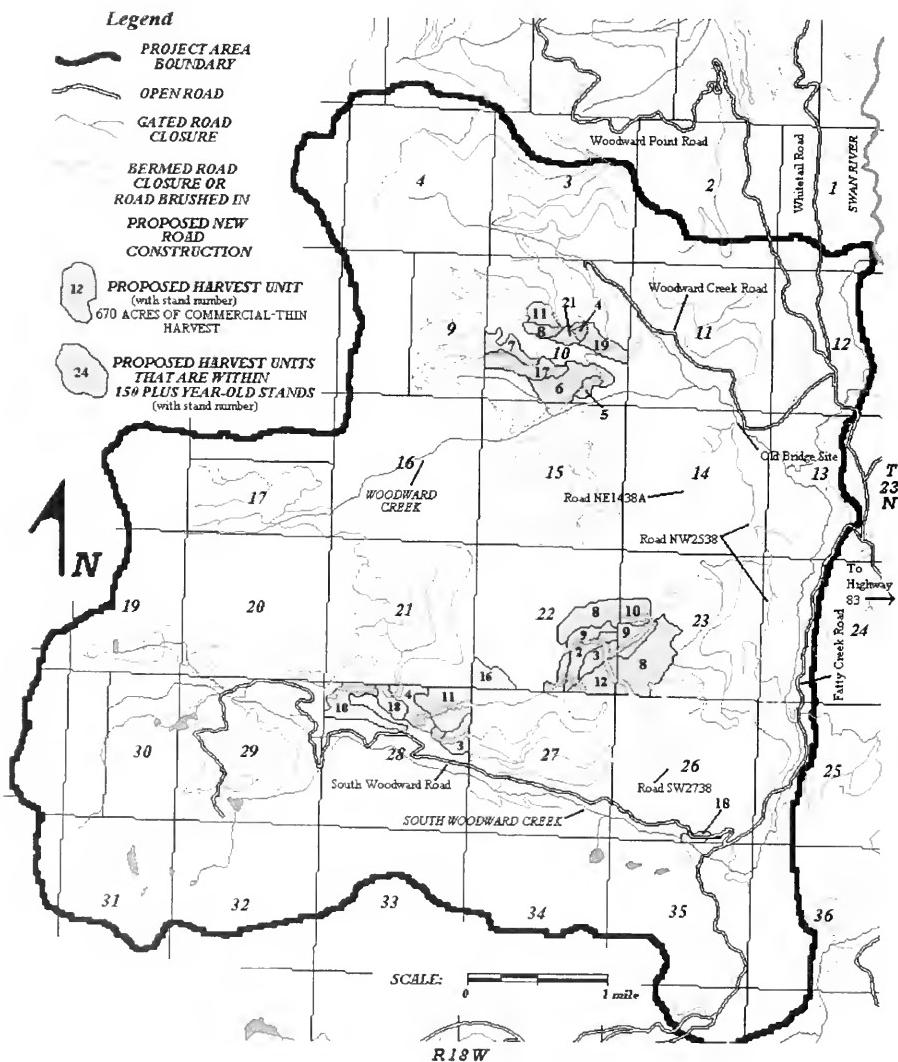
Under Action Alternative C, 2.76 miles of new road (0.3 miles in preferred, 1.7 miles in suitable, and 0.6 miles in travel habitat) would be constructed (TABLE F-5 - SUMMARY OF FISHER HABITAT

VARIABLES MODIFIED BY ALTERNATIVE), which would increase the vulnerability of fishers to trapping. These proposed roads occur away from streams and extend from existing roads, thereby reducing the effects of these roads. The effects of the new roads to fisher mortality are expected to be minimal.

- **Indirect Effects of Action, Alternative D**

The effects of this alternative are similar to Action Alternative C, except Action Alternative D would harvest more preferred habitat and would construct more new roads. Commercial-thin harvests would modify 45 acres of preferred habitat, 411 acres of suitable habitat, and 211 acres of travel habitat (TABLE F-5 - SUMMARY OF FISHER HABITAT VARIABLES MODIFIED BY ALTERNATIVE). Under this alternative, 5.4 miles of new road (0.7 miles in preferred habitat, 2.1 miles in suitable habitat, and 2.5 miles in travel habitat) would be constructed, which would increase the vulnerability of fishers to trapping. Proposed Road SW2738 (see FIGURE F-1 PROJECT AREA MAP FOR ACTION ALTERNATIVE D) also accesses preferred fisher habitat and several stream corridors. The construction of this road increases the vulnerability of fishers to trapping. This alternative would harvest more preferred habitat than Action Alternative C, which would result in more effects to fishers; the additional road would increase the risk of mortality to fishers.

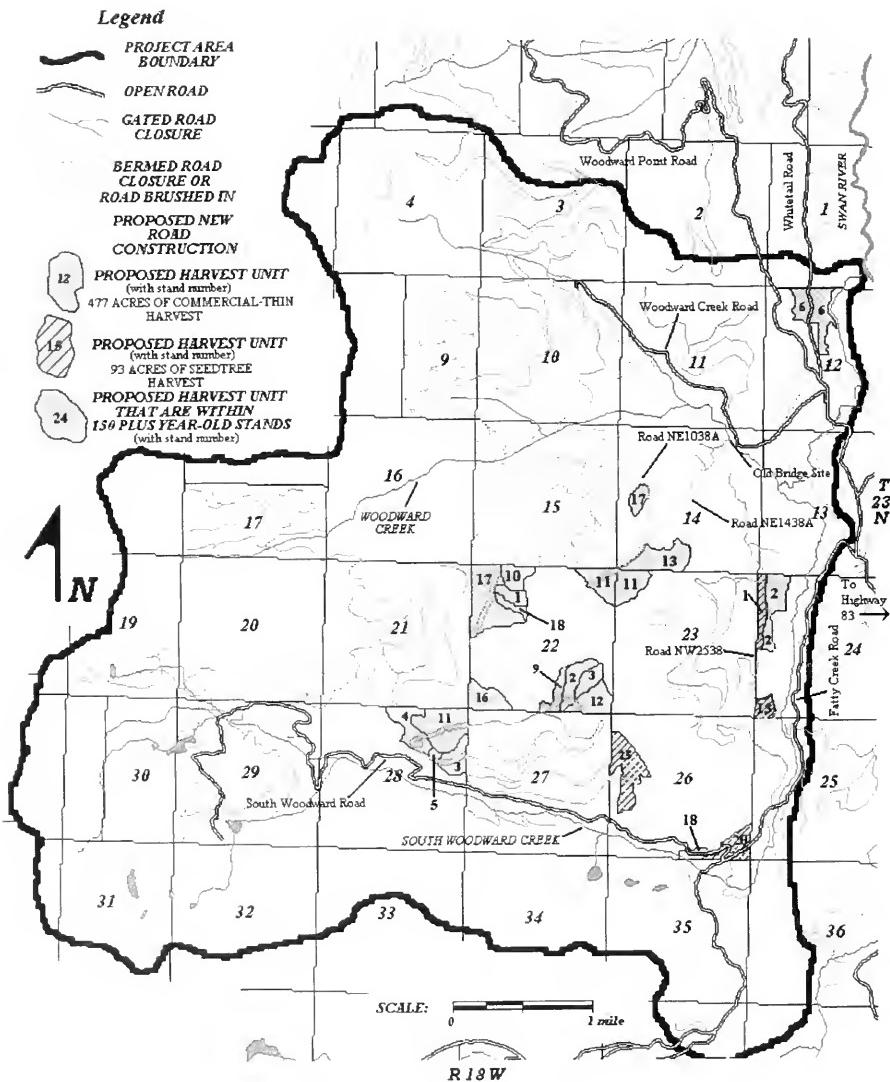
FIGURE F-1 - PROJECT AREA MAP FOR ACTION ALTERNATIVE D



- ***Indirect Effects of Action, Alternative E***

The effects of this alternative are similar to Action Alternative C, except this alternative would harvest more preferred habitat, use some seedtree harvests, and construct more new roads. Most of the harvesting would be done with a commercial-thin treatment and would modify 81 acres of preferred habitat, 233 acres of suitable habitat, and 256 acres of travel habitat (*TABLE F-5 - SUMMARY OF FISHER HABITAT VARIABLES MODIFIED BY ALTERNATIVE*). Seedtree harvests would remove 41 acres of preferred habitat and 93 acres of travel habitat. Under Action Alternative E, 4.8 miles of new road (1.2 miles in preferred, 1.2 miles in suitable, and 2.3 miles in travel habitat) would be constructed, which would increase the vulnerability of fishers to trapping. The proposed extension of Road NE1038A (see *FIGURE F-2 PROJECT AREA MAP FOR ACTION ALTERNATIVE E*) also accesses preferred fisher habitat and several stream corridors. The construction of this road increases the vulnerability of fishers to trapping. The harvested units would be expected to shift fisher habitats; no travel barriers would be produced. Due to the amount and placement of the new roads, an increased risk of mortality, similar to Action Alternative D, would be expected.

FIGURE F-2 - PROJECT AREA MAP FOR ACTION ALTERNATIVE E



• Indirect Effects of Action Alternative F

The effects of this action alternative are similar to Action Alternative C, except less harvesting and road construction in fisher habitat would occur. This alternative would modify 51 acres of preferred habitat, 376 acres of suitable habitat, and 87 acres of travel habitat.

Approximately, 0.2 miles of road construction would occur in preferred habitat, 1.2 miles in suitable habitat, and 0.9 miles in unsuitable habitat (or off DNRC lands). The effects of these actions are expected to be similar, but less than Action Alternative C.

Cumulative Effects to Fishers

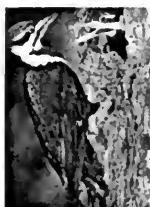
Cumulative Effects Common to All Alternatives

Salvage operations on DNRC lands decreased habitat quality on lands where this salvaging occurred. Salvage and regeneration harvests, especially in old growth, reduced the amount of habitat available on adjacent Plum Creek Timber Company lands. Habitat conditions on USFS lands are expected to improve over time. Under all alternatives, movement corridors from the project area into the cumulative effects area would be retained. The effects of the new roads, discussed above, would also apply to the cumulative effects area.

➤ Pileated Woodpeckers

Existing Conditions

Pileated woodpeckers play an important ecological role by excavating cavities that are used in subsequent years by many other species of



birds and mammals. Due to this important ecological niche, DNRC named the pileated woodpecker to their sensitive species list.

Pileated woodpeckers excavate the largest cavities of any woodpecker; preferred nest trees are western larch, ponderosa pine, cottonwood, and aspen, usually 20 inches dbh and larger. Pileated woodpeckers primarily eat carpenter ants, which inhabit large downed logs, stumps, and snags. Nesting habitat for pileated woodpeckers was described by Aney and McClelland (1985) as "stands of 50 to 100 contiguous acres, generally below 5,000 feet in elevation, with basal areas of 100 to 125 square feet per acre, and a relatively closed canopy." The feeding and nesting habitat requirements, including large snags or decayed trees for nesting and large downed wood for feeding, closely tie these woodpeckers to mature forests with old-growth characteristics. The density of pileated woodpeckers is positively correlated with the amount of dead and/or dying wood in a stand.

Potential pileated woodpecker nesting habitat was identified by searching the SLI database for old stands with more than 100 square feet per acre, more than 40 percent canopy cover, and are below 5,000 feet in elevation. Based on these parameters, approximately 1,552 acres of potential habitat for pileated woodpeckers are scattered throughout the project area on DNRC lands. Stands that are younger might provide feeding or nesting habitat of lower quality.

Since the project area is large, the analysis conducted for the project area encompassed enough area to support several pairs of pileated woodpeckers. Therefore, the cumulative-effects analysis area is the project area.

Direct Effects to Pileated Woodpeckers

• Direct Effects of No Action, Alternative J

No disturbance of pileated woodpeckers would occur.

• Direct Effects Common to Action Alternatives B, C, D, E, and F

Pileated woodpeckers might be displaced or, if harvesting occurs during the nesting season, May through June (Bull personal communication), some mortality might occur if nest trees are cut. The effects of harvest disturbances are unknown; however, Bull et al. (1995) observed a marked woodpecker roosting near a harvest unit consistently throughout harvesting activities. Some displacement might occur; however, the effects are not expected to be measurable.

Indirect Effects to Pileated Woodpeckers

• Indirect Effects of No Action, Alternative J

The existing trees would continue to grow in diameter and die, thus providing pileated woodpecker habitat. However, as these trees die, barring any disturbance, replacement trees (shade-intolerant) would not be present. Therefore, under this alternative, pileated woodpecker habitat would increase through time, then decline.

• Indirect Effects of Action, Alternative B

This alternative would remove 288 acres (19 percent) of pileated woodpecker nesting habitat (TABLE F-6 - SUMMARY OF

PILEATED WOODPECKER HABITAT MODIFIED BY ALTERNATIVE). The seedtree-type harvests, along with harvesting snags, would likely remove nesting-habitat quality for a long period of time in all of the proposed units. However, feeding in all proposed units might occur if large-diameter trees and snags are retained. This removal would likely result in a decrease in pileated woodpeckers reproduction in the area until these units regenerate to provide adequate canopy and midstory cover.

TABLE F-6 - SUMMARY OF PILEATED WOODPECKER HABITAT MODIFIED BY ALTERNATIVE

ALTERNATIVE	POTENTIAL NESTING HABITAT MODIFIED (ACRES)	POTENTIAL NESTING HABITAT REMOVED (ACRES)
A	0	0
B	288	288
C	83	51
D	0	0
E	243	55
F	0	0

• Indirect Effects of Action, Alternative C

This alternative would modify 83 acres (5 percent) of pileated woodpecker nesting habitat and remove 51 acres of nesting habitat. In these proposed units, a commercial-thin harvest would leave most of the dominant trees and 25 to 60 percent of the canopy cover. Many dominant trees would be retained and are expected to have increased growth rates due to the reduced competition. Additionally, snags that have been dead for more than 1 year would be retained, though some snags would be lost due to harvesting. Since pileated woodpeckers use areas that

average canopy cover of 41 percent for nesting and 51 percent for roosting (McClelland and McClelland 1999), and dominant trees and snags would be retained, the effects of these treatments on pileated woodpeckers would be minimal in stands meeting this criteria. Similarly, Bull et al. (1995) found that, if habitat qualities are retained, pileated woodpeckers still use the stands following harvesting. The additional roads would allow for salvage harvesting in the future, which would reduce the habitat structure for pileated woodpeckers. The potential effects of roads would be proportional to the amount of new roads. Therefore, no substantial effects to pileated woodpeckers are expected from this alternative.

The commercial-thin treatments outside of pileated woodpecker habitat would likely result in an increased growth rate in desirable tree species (western larch, Douglas-fir, and western red cedar); thereby, potential pileated woodpecker habitat would develop at a faster rate than without treatment. In the long term, pileated woodpeckers might benefit from this alternative by increased habitat.

- ***Indirect Effects of Action Alternative D***

No harvesting would occur in pileated woodpecker habitat. The commercial-thin treatments outside of pileated woodpecker habitat would likely result in an increased growth rate in desirable tree species (western larch, Douglas-fir, and western red cedar), thereby, potential pileated woodpecker habitat would develop at a faster rate

than without treatment. The additional roads would allow for salvage harvesting in the future, which would reduce habitat structure for pileated woodpeckers. The potential effects of roads would be proportional to the amount of new roads. In the long term, pileated woodpeckers might benefit from this alternative by increased habitat.

- ***Indirect Effects of Action Alternative E***

The effects to pileated woodpeckers would be similar to Action Alternative C, except 243 acres (15 percent) of pileated woodpecker nesting habitat would be modified, 55 acres would be removed from potential nesting habitat, and more road would be constructed. Therefore, the effects of this alternative are similar to Action Alternative C, but more habitat would be modified. Nesting habitat in the area would be reduced to a similar degree and would produce more potential for salvaging in the future, which would result in decreased pileated woodpecker habitat.

- ***Indirect Effects of Action Alternative F***

The effects of this alternative are similar to Action alternative D, except the amount and potential for salvaging and firewood cutting due to the road construction would be reduced.

Cumulative Effects to Pileated Woodpeckers

- ***Cumulative Effects of No-Action Alternative I***

Pileated woodpecker habitat in and around the project area would increase through time, then decline.

- **Cumulative Effects Common to Action Alternatives B, C, D, E, and F**

Potential nesting cover would be reduced. This loss would be additive to past and current harvests on Plum Creek Timber Company lands and salvage operations on DNRC lands. Action Alternative B would reduce pileated woodpecker habitat in the analysis area more than Action Alternatives C, E, F, and D, respectively.

BIG GAME

Existing Conditions

The project area contains only white-tailed deer winter range; no winter ranges for other big game species occur within the project area. The project area contains approximately 385 acres of white-tailed deer winter range, which extends east from the project area into a 36,384-acre winter range. Since winter range is a bottleneck for a big game population, this analysis discusses only white-tailed deer winter range.

White-tailed Deer

Direct Effects to White-Tailed Deer

- **Direct Effects of No Action, Alternative I**

No direct effects on white-tailed deer would occur.



- **Direct Effects of Action, Alternatives B, C, D, E, and F**

If harvesting occurs outside of the winter period, no direct effects to wintering deer would occur. Increased traffic on the Lower Whitetail and Fatty Creek

roads might increase disturbance slightly. Harvesting in Stand 12-06 during the winter might congregate deer in the harvest unit. However, no measurable effects are expected under any alternative.

Indirect Effects to White-Tailed Deer

- **Indirect Effects of No Action, Alternative I and Action, Alternatives D and F**

No winter range would be modified under No-Action Alternative A. The commercial-thin harvesting proposed by Action Alternatives D and F would reduce thermal cover, but is not expected to affect the use of winter range by white-tailed deer.

- **Indirect Effect of Action, Alternatives B, C, and E**

These alternatives would harvest 35 acres (Stand 12-06) of winter range. Under Action Alternative B, the unit would be harvested with a seedtree silviculture treatment, which would remove thermal cover. However, due to the small size of Stand 12-06, harvesting in this stand is not expected to result in any measurable change in big game use or population in the area. The commercial-thin harvesting proposed by Action Alternative C on white-tailed deer winter range would reduce thermal cover, but is not expected to affect white-tailed deer use of the area.

Cumulative Effects to White-Tailed Deer

Since the project only affects 35 acres in a 36,384-acre winter range and cover that is around the harvest unit is available, the cumulative effects of any alternative would be negligible.

SOUTH WOOD TIMBER SALE PROJECT

SOILS ANALYSIS

APPENDIX G

INTRODUCTION

The Woodward Creek watershed is a valley formed by alpine glaciation. The dominant soil types found in the project area are deep glacial tills derived from argillite, siltite, and limestone from the Belt Supergroup. Upper slopes and ridges are weathered bedrock scoured by glaciers.

ANALYSIS METHODS

Soil productivity will be analyzed by evaluating the current levels of soil disturbance in the proposed project area. Analysis criteria will also include soil-stability risk factors.

ANALYSIS AREA

The analysis area for evaluating soil productivity will include DNRC-owned land in the Woodward Creek watershed. The Woodward Creek watershed encompasses the entire project area.

EXISTING CONDITIONS

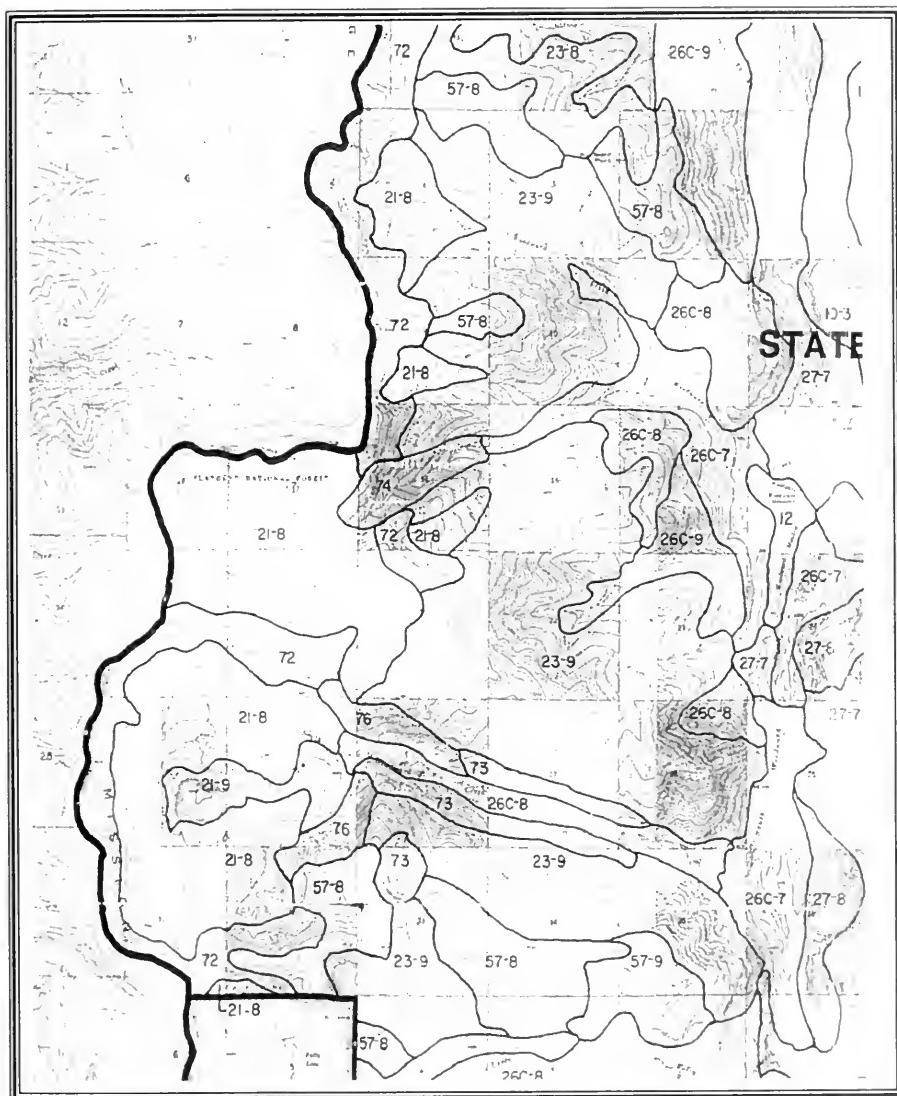
DNRC has conducted timber harvesting in the Woodward Creek watershed since the 1960s. Since that time, 1,046 acres have been harvested on State land using a combination of ground-based and cable-yarding harvest methods. Ground-based yarding affects soil productivity through displacement and compaction of productive surface layers of soil. The proper spacing of skid trails and season-of-use restrictions are the most effective methods to minimize the loss of productivity. Past harvest units in the project area have adequate spacing of skid trails and are regenerating well.

Soil types in the project area vary from nearly level wetland types along Woodward Creek to steep valley sideslopes on ridges. The FNF Soil Survey (Martinson and Basko, 1983) identified one area of high-risk soil in the project area. This area is landtype 74, located in Section 16 along Main Woodward Creek on DNRC land, identified as very steep and susceptible to slope failure (see FIGURE 1 SOUTH WOOD PROJECT AREA SOIL MAP). No slope failures were identified during reconnaissance in this area. A list of soil types found in the Woodward Creek watershed and their associated management implications is found in TABLE G-1 SUMMARY OF DIRECT EFFECTS OF ALTERNATIVES ON SOILS.

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FIGURE G-1 - SOUTH WOOD PROJECT AREA SOIL MAP



DIRECT EFFECTS

• ***Direct Effects of No Action, Alternative I***

Soil productivity would not be affected. No ground-based activity would take place under this alternative, which would leave the soil in the project area unchanged.

• ***Direct Effects of Action, Alternative B***

Approximately 53 acres of ground would be directly impacted. Direct impacts would include compaction and displacement resulting from the use of ground-based equipment to skid logs on approximately 303 acres. Ground-based site preparation and road construction would also generate direct impacts to the soil resource. *TABLE G-1 - SUMMARY OF DIRECT EFFECTS OF ALTERNATIVES ON SOILS* summarizes the expected impacts to the soil resource as a result of Action Alternative B. The impacts would leave approximately 17 percent of the proposed harvest units in an impacted condition. This level of disturbance exceeds the threshold recommended by BMPs. In order to remain within recommended levels of disturbance, additional mitigation may be necessary.

• ***Direct Effects of Action, Alternative C***

Approximately 6 acres of ground would be directly impacted. Direct impacts would include compaction and displacement resulting from the use of ground-based equipment to skid logs on approximately 302 acres. No ground-based site preparation would be completed with this alternative (the commercial-thin prescription would not require site preparation). New road construction would also lead to direct impacts to the soil resource. *TABLE G-1 - SUMMARY OF DIRECT EFFECTS OF ALTERNATIVES ON SOILS* summarizes the expected impacts to the soil resource as a result of Action Alternative C. All impacts generated would be well within the 15-percent disturbance threshold recommended by BMPs.

• ***Direct Effects of Action, Alternative D***

Approximately 5 acres of ground would be directly impacted. Direct impacts would include compaction and displacement resulting from the use of ground-based equipment to skid logs on approximately 235 acres. No ground-based site preparation would be completed with this alternative (the commercial-thin prescription would not require site preparation). New road

TABLE G-1-SUMMARY OF DIRECT EFFECTS OF ALTERNATIVES ON SOILS

ALTERNATIVE	ACRES OF HARVEST	ACRES OF CABLE YARDING	ACRES OF TRACTOR YARDING	ACRES OF SKID TRAILS	ACRES OF GROUND-BASED SITE PREPARATION	MAXIMUM ACRES OF SOIL IMPACTED	PERCENT OF HARVEST UNITS IMPACTED
A	0	0	0	0	0	0	0
B	313	10	303	61	311	53	17
C	628	326	302	61	0	6	1
D	667	432	235	47	0	5	1
E	570	220	350	70	104	23	4
F	514	285	229	46	0	5	1

construction would also lead to direct impacts to the soil resource. TABLE G-1 - SUMMARY OF DIRECT EFFECTS OF ALTERNATIVES ON SOILS summarizes the expected impacts to the soil resource as a result of Action Alternative D. All impacts generated would be well within the 15-percent disturbance threshold recommended by BMPs.

- ***Direct Effects of Action Alternative E***

Approximately 23 acres of ground would be directly impacted. Direct impacts would include compaction and displacement resulting from the use of ground-based equipment to skid logs on approximately 350 acres. Ground-based site preparation and road construction would also generate direct impacts to the soil resource. TABLE G-1 - SUMMARY OF DIRECT EFFECTS OF ALTERNATIVES ON SOILS summarizes the expected impacts to the soil resource as a result of Action Alternative E. All impacts generated would be well within the 15-percent disturbance threshold recommended by BMPs.

- ***Direct Effects of Action Alternative F***

Action Alternative F would have direct impacts on approximately 5 acres of ground. Direct impacts would include compaction and displacement resulting from use of ground-based equipment to skid logs on approximately 229 acres. Site preparation and road construction with ground-based equipment would also generate direct impacts to the soil resource. TABLE G-1 - SUMMARY OF DIRECT EFFECTS OF ALTERNATIVES ON SOILS summarizes the expected impacts to the soil resource as a result of Action Alternative F. All impacts generated would be well within the 15-percent disturbance threshold recommended by BMPs.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative I***

This alternative would have no indirect effects on soil productivity. No further soil disturbance would be generated in the project area. No further decrease in soil productivity would occur.

- ***Indirect Effects Common to Action Alternatives B, C, D, E, and F***

No action alternatives propose to conduct timber-harvesting or road-construction activities on unstable landtypes or in areas identified as unstable slopes. The unstable soils identified in Section 16 of the proposed project area would be avoided by all action alternatives. All steep slopes where activity is proposed would implement appropriate mitigation measures for logging systems, road construction, site preparation, and erosion control. These measures would ensure that adverse impacts to soil productivity would not result from proposed activities.

- ***Indirect Effects of Action Alternative B***

The indirect effects would be related to the impacts discussed under DIRECT EFFECTS. Ground-based skidding would generate approximately 61 acres of skid trails and, combined with ground-based-excavator site preparation, would leave approximately 53 acres in an impacted condition. These acres would have decreased productivity due to compaction and displacement of surface soil layers. The areas impacted by trails would have difficulty revegetating following the proposed activities. The bare soil generated by ground-based activity would increase the risk of surface erosion. Standard

erosion-control measures would minimize the risk of surface erosion on these trails.

- ***Indirect Effects of Action, Alternative C***

The indirect effects would be related to the impacts discussed under *DIRECT EFFECTS*. Ground-based skidding would generate approximately 61 acres of skid trails and, combined with ground-based-excavator site preparation, would leave approximately 6 acres in an impacted condition. These acres would have decreased productivity due to compaction and displacement of surface soil layers. The areas impacted by trails would have difficulty revegetating following the proposed activities. The bare soil generated by ground-based activity would increase the risk of surface erosion. Standard erosion-control measures would minimize the risk of surface erosion on these trails.

- ***Indirect Effects of Action, Alternative D***

The indirect effects would be related to the impacts discussed under *DIRECT EFFECTS*. Ground-based skidding would generate approximately 47 acres of skid trails and, combined with ground-based-excavator site preparation, would leave approximately 5 acres in an impacted condition. These

acres would have decreased productivity due to compaction and displacement of surface soil layers. The areas impacted by trails would have difficulty revegetating following the proposed activities. The bare soil generated by ground-based activity would increase the risk of surface erosion. Standard erosion-control measures would minimize the risk of surface erosion on these trails.

- ***Indirect Effects of Action, Alternative E***

The indirect effects would be related to the impacts discussed under *DIRECT EFFECTS*. Ground-based skidding would generate approximately 70 acres of skid trails and, combined with ground-based-excavator site preparation, would leave approximately 23 acres in an impacted condition. These acres would have decreased productivity due to compaction and displacement of surface soil layers. The areas impacted by trails would have difficulty revegetating following the proposed activities. The bare soil generated by ground-based activity would increase the risk of surface erosion. Standard erosion-control measures would minimize the risk of surface erosion on these trails.



Skid trail that has been seeded with grass.



Equipment working in the landing area causes compaction.

- *Indirect Effects of Action, Alternative F*

The indirect effects would be related to the impacts discussed under *DIRECT EFFECTS*. Ground-based skidding would generate approximately 46 acres of skid trails and, combined with ground-based-excavator site preparation, would leave approximately 5 acres in an impacted condition. These acres would have decreased productivity due to compaction and displacement of surface soil layers. The areas impacted by trails would have difficulty revegetating following the proposed activities. The bare soil generated by ground-based activity would increase the risk of surface erosion. Standard erosion-control measures would minimize the risk of surface erosion on these trails.

CUMULATIVE EFFECTS

- *Cumulative Effects of No-Action, Alternative A*

This alternative would have no cumulative impacts on soil productivity. No soil would be disturbed under this alternative, and no reentry of past harvest units would occur with No Action Alternative A.

- *Cumulative Effects Common to Action Alternatives B, C, D, E, and F*

Each action alternative would enter stands not previously entered for a timber sale. Some stands have had small salvage operations within 100 to 200 feet of the existing roads. Existing skid trails from salvage activities would be used if they are properly located and spaced. With the remainder of the proposed project area previously unharvested, cumulative effects to soil productivity from multiple entries would be the same as those listed under *DIRECT EFFECTS* and *INDIRECT EFFECTS*.

TABLE G-2 – SOIL MAP UNIT DESCRIPTIONS FOR THE SOUTH WOOD PROJECT AREA

MAP UNIT	DESCRIPTION	SOIL DRAINAGE	ROAD LIMITATIONS	TOPSOIL DISPLACEMENT AND COMPACTION	SEEDLING ESTABLISHMENT	EROSION (BARE SURFACE)	NOTES
10-3	Stream bottoms	Poorly to well drained	Moderate to severe	Severe	Good	Low	SMZ Law and Rules apply.
12	Organic depressions	Poor	Severe	Severe	Poor	Slight	Wetland soil types; avoid operation.
21-8	Cirque basins 20-40 percent slopes	Somewhat rock on ridges	Moderate	Fair, drought	Moderate	Moderately deep coarse soils reduce water and nutrients. South slopes drought. On slopes over 35 percent, lop and scatter slash, excavator pile, or broadcast burn.	
21-9	Cirque basins 40-60 percent excessive slopes	Somewhat rock outcrops	Moderate/high	Fair, drought	Moderate/ high	Moderately deep coarse soils reduce water and nutrients. South slopes very droughty. Cable yard on slopes over 45 percent, or soft track on up to 55 percent slopes.	
23-8	Glaciated mountain slopes of 20-40 percent	Well drained	Low	Moderate/high	Moderate - competition	Moderately deep coarse soils reduce water and nutrients. South slopes over 45 percent, lop and scatter slash, excavator pile, or broadcast burn.	
23-9	Glaciated mountain slopes of 40-60 percent	Well drained	Low	Moderate/high	Moderate - competition	Moderately deep coarse soils reduce water and nutrients. South slopes over 45 percent, or soft track on up to 55 percent slopes.	
26A-7	Deep glacial till 0-20 percent	Well drained	Low	Moderate (severe if wet)	Good	Low	Deep, productive soil is well suited to tractor operations. The dry season of use is limited.
26A-8	Glacial till 20-40 percent	Well drained	Moderate	Moderate	Good	Moderate	Deep, productive soil. Fine-textured soil remains moist, check soil moisture; topsoil depth is important.
26A-9	Glacial till 40-60 percent	Well drained	Low (some rock)	Moderate compaction/ high displacement	Good	Moderate to high	Deep soils. Steep slopes limit equipment operations. Cable yarding reduces impacts.

TABLE G-2 - SOIL MAP UNIT DESCRIPTIONS FOR THE SOUTH WOOD PROJECT AREA (continued)

MAP UNIT	DESCRIPTION	SOIL DRAINAGE	ROAD LIMITATIONS	TOPSOIL DISPLACEMENT AND COMPACTION	SEEDLING ESTABLISHMENT	EROSION (BARE SURFACE)	NOTES
26C-7	Glacial moraines, 0-20 percent slopes	Well drained	Low (severe if wet)	Moderate	Good	Low	Deep, productive soil. Topsoil depth is important.
26C-8	Glacial moraines, 0-20 percent slopes	Well drained	Low (severe if wet)	Moderate	Good	Low	Deep, productive soil. Topsoil depth is important.
26C-9	Glacial moraines, 40-60 percent slopes	Well drained	Moderate/ high	Moderate/high	Good	Moderate/ high	Deep productive soil, average season of use. Limit soft-track skidder to slopes less than 45 percent.
26L-7	Glacial moraines, 0-20 percent slopes	Well drained	Low (severe if wet)	Moderate	Good	Moderate	Deep, productive soil. Topsoil depth important.
27-7	Glacial terraces, 0-20 percent slopes	Well drained	Low	Moderate/high	Moderate	Low/ Moderate	Topsoil depth is very important.
27-8	Glacial terraces, 20-40 percent slopes	Well drained	Moderate	Moderate/high	Moderate	Low/ moderate	Topsoil depth is very important
57-8	Residual soils and moderate deep glacial till 20-40 percent slopes	Well drained	Moderate	Low compaction, moderate/severe displacement	Fair/good, droughty on south slopes	Moderate	Shallow topsoils; use care during brush piling and scarification on slopes less than 40 percent. On slopes over 40 percent, plan cable logging or contour skid trails on 150-foot minimum spacing.
57-9	Residual soils and moderate deep glacial till 40-60 percent slopes	Well drained	Moderate	Low compaction, moderate/severe displacement	Fair/good, droughty on south slopes	Moderate	Shallow topsoil, steep slopes. Use cable yarding system.
72	Alpine ridges	Excessive	Moderate to severe (steep and rocky)	High displacement	Harsh site; poor	Moderate	Low productivity; few trees.
73	Glacial trough walls	Well drained	Moderate to severe (steep and rocky)	High displacement	Fair	Moderate/ high	Steep slopes require cable operation.

TABLE G-2 - SOIL MAP UNIT DESCRIPTIONS FOR THE SOUTH WOOD PROJECT AREA (continued)

MAP UNIT	DESCRIPTION	SOIL DRAINAGE	ROAD LIMITATIONS	TOPSOIL DISPLACEMENT AND COMPACTION	SEEDLING ESTABLISHMENT	EROSION (BARE SURFACE)	NOTES
74	Stream breaklands, 60-90 percent slopes	Well drained	Moderate to severe (steep and rocky)	High displacement	Fair (competition)	High	Steep slopes and landslide hazard. Use appropriate yarding system.
76	Structural breaklands over 60 percent slopes	Excessive	Severe; rock outcrops	High displacement	Good	High	Steep slopes, rocky soils with common rock outcrops. Cable logging recommended for slopes over 45 percent. Lop and scatter or pile slash with excavator.

SOUTH WOOD TIMBER SALE PROJECT

ECONOMICS ANALYSIS APPENDIX H

INTRODUCTION

The economic analysis estimates important consequences of adopting the various project alternatives considered in this document in terms of Montana public school finance. Each alternative was developed within environmental guidelines of the existing SFLMP; the economic analysis is designed to document the direct, indirect, and cumulative impacts on kindergarten through 12 public schools in Montana so that land managers and the public may be better able to make informed land-management judgments. Lands granted to Montana in statehood are managed to provide a legitimate return to the beneficiaries of the school trust. Each alternative considered in this document means that taxpayers and the legislature are faced with a different and unique set of school finance consequences.

EXISTING CONDITIONS

For children in grades kindergarten through 12 attending public schools in Montana, expenditures per pupil were estimated to be \$5,869 in 1999 (the most recent data available). This places Montana below the national average (*Montana Office of Public Instruction Web Site*). Direct school income comes from a number of sources:

- Natural resource income is derived from managing the States trust lands. Some State aid for common schools comes from interest earnings from trust funds.
- The Montana legislature augments income from the trust.
- Local school districts also raise income through property taxes. The taxable value of property is an important factor that influences the ability of a local school district to generate tax revenue.

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DIRECT EFFECTS

The estimated direct effects of the South Wood Timber Sale Project alternatives on school finance are shown in TABLE H-1 - NUMBER OF STUDENTS SUPPORTED FOR 1 YEAR BY ESTIMATED REVENUE PRODUCED BY ALTERNATIVE.

Action Alternative B, which was designed to generate as much revenue as possible within the bounds of the governing forest plan and broader environmental policy, is estimated to produce slightly more than \$1,789,331. If this alternative were adopted, the South Wood Timber Sale Project would produce enough revenue to send the equivalent of 297 kindergarten-through-12 children to school for 1 year without any other financial support.

Action Alternative C was designed around the environmental philosophy of improving biodiversity in the forest. This alternative would produce \$1,173,837, enough to support the equivalent of 195 kindergarten-through-12 school children for a year.

Action Alternative D is another alternative designed to improve biodiversity. This alternative would produce an estimated \$1,196,500, enough to support the equivalent of 200 kindergarten-through-12 school children for a year.

Action Alternative E stresses development of road infrastructure. The purpose of this alternative is to improve managerial access to the Swan River State Forest. Improved access could improve fire-suppression activities and, in general, improve forest management in the future. This alternative would produce an estimated \$1,310,948 in school revenue, enough to support the equivalent of 218 kindergarten-through-12 school children for a year.

Action Alternative F stresses the protection of old growth since the only old growth taken is in the road right-of-way. This alternative would produce \$1,054,378 in school revenue, enough to support the equivalent of 175 kindergarten through grade 12 children for a year.

Alternative A produces no revenue for schools that could be used to support kindergarten through grade 12 children for a year.

The specific revenue and expenditure estimates for Action Alternatives B through F are summarized in TABLE H-2 - ESTIMATED REVENUES AND EXPENDITURES FOR ACTION ALTERNATIVES B, C, D, E, and F. It is worthwhile to discuss why the differences in revenues arise from these alternatives. Action Alternative B has the highest income to the Common Schools because it contains the most valuable timber, requires the fewest miles of road construction (lowest development cost), has the fewest miles of road rehabilitation or reconstruction (lowest maintenance costs), and contains slightly more timber volume than the other alternatives.

School finance is directly driven by the market economy. A strong market economy creates high personal and business incomes and high residential and commercial real estate values. High real estate values translate into higher property tax receipts for local schools. School excellence is a function, at least in part, of school finance.

INDIRECT EFFECTS

State timber sales also indirectly support schools by influencing personal and business incomes, as well as the assessed value of land owned by workers, the timber industry, and the host of others who are directly or indirectly affected by timber-industry transactions.

TABLE H-1-NUMBER OF STUDENTS SUPPORTED FOR 1 YEAR BY ESTIMATED REVENUE PRODUCED BY ALTERNATIVE

ALTERNATIVE	ESTIMATED REVENUE	EQUIVALENT KINDERGARTEN THROUGH 12 STUDENTS ¹
Alternative A ²	0	0
Alternative B	\$1,789,363	297
Alternative C	\$1,173,763	195
Alternative D	\$1,196,515	200
Alternative E	\$1,311,050	218
Alternative F	\$1,054,378	175

¹The 1999 student expenditure figure was converted to the equivalent purchasing power of third quarter 2000 dollars by using the Implicit GNP Deflator. This made the students expenditures equivalent to the estimated timber income in the terms of the purchasing power of money. The trust income is expressed on a per-student-equivalent basis since the legislature distributes trust earnings to a variety of accounts in addition to education trust funds. Trust earning distributed annually to the general fund are considerably less than the total State contribution to the common schools. The use of the kindergarten-through-12 equivalent measure helps clarify impacts on school finance in a straightforward manner. Of course, costs differ between schools and school districts, so the per-student equivalent is a Statewide average. The kindergarten-through-12 student equivalents are also employed in the discussion of indirect taxes generated.

²DNRC has a Statewide sustained-yield harvest volume of 42.164 MMBF per year.

TABLE H-2-ESTIMATED REVENUES AND EXPENDITURES FOR ACTION ALTERNATIVES B, C, D, E, AND F

	ACTION ALTERNATIVE				
	B	C	D	E	F
1. Harvest Volume (MBF) ³	6,078	5,367	5,311	5,786	4,485
2. Development Cost (\$/MBF)	2.02	13.97	25.37	20.65	11.77
3. Stumpage Price (\$/MBF) ⁴	294.3946	218.7138	225.2872	226.5725	235.0898
4. Forest Improvement (FI) (\$/MBF)	52.25	52.25	52.25	52.25	52.25
5. Estimated Market Benefits (Stumpage + Development + FI) ⁵	348.67	284.92	302.91	299.49	287.34
6. Maintenance Costs ⁶ (\$/MBF)	2.71	6.63	6.21	8.81	6.69
7. Trust Income (line 1 x line 3) (\$)	1,789,363	1,173,763	1,196,515	1,311,050	1,054,378
8. State Income (lines [3 + 4] x line 1) (\$)	2,106,906	1,454,263	1,474,000	1,613,267	1,288,719
9. Expenditures (lines 2 + 4 + 6 x line 1) (\$)	346,324	390,986	445,221	472,774	366,469

³Harvest volumes were provided by ID Team Leader, Dan Roberson.

⁴In estimating these stumpage prices, the current transaction evidence appraisal equation was used. Wood product prices used in the model utilized average western wood-product prices for the previous 2-year period. The USFS volume-under-contract variable was the most recent level available. Prices were expressed in third quarter 2000 equivalent prices utilizing the Implicit GNP Deflator. The Transaction Evidence system uses a multivariate regression equation to predict the winning bid value for a timber sale based on sale characteristics and market information. There was no other expected current revenue dependent upon this project.

⁵FI cost is based on programwide costs, such as the cost of maintaining ongoing agency staffing, maintenance needs for the current year, as well as right-of-way acquisition. Money collected under FI from purchasers provides funds for projects (tree planting, site preparation, slash treatment, thinning, road maintenance, road acquisition, and some timber-sale-related activities). Thus, DNRC is able to improve long-term timber productivity on State trust lands and maintain or acquire access for future revenue-producing activities. Other than road construction, no sale-specific improvement costs are included in item 2.

⁶Maintenance costs were estimated on the project by Gary Hadlock, DNRC Forest Engineer, and are expressed on a per thousand board feet (MBF) basis.

Federal timber supplies have diminished in Montana, which has caused the closure of some important sawmills. For example, the closure of American Timber in Olney, Montana was linked to the decline in Federal timber offerings (the CEO was quoted to this effect in a *Missoulian* newspaper article on 1/12/2000). More recently, Pyramid Lumber of Seeley Lake has given notice of an impending closure. The Missoula County Commissioners are currently in the process of developing a refinancing package that will allow this mill to remain operating.

In situations such as these, mill closures reduce employment, business earnings, and the assessed value of land and structures. Mill closures further affect timber values by reducing the potential number of timber purchasers. Loss of a mill in a community can have substantial impacts on school finance. Maintaining timber sale levels helps maintain the earnings of workers, the infrastructure of the industry and communities in and around the forests, and the taxable base that supports Montana's schools and government in general.

Impacts on local communities are typically estimated by quantifying jobs and incomes that are associated with the harvesting and processing of timber products. Estimates of employment in these industries in northwest Montana are 10.58 direct jobs per MMBF harvested and an annual income of \$31,866 per job (Keegan, et al.). The direct employment and earnings effects of the alternatives are summarized in TABLE H-3 - EMPLOYMENT AND EARNINGS IMPACTS.

The impacts summarized in TABLE H-3 - EMPLOYMENT AND EARNINGS IMPACTS are substantial in terms of both their absolute and relative importance. The adoption of No-Action Alternative A will cost the State in both lost jobs and lost income. The wood-product industry tends to be a highly

integrated industry. Shown in this table are only the direct employment impacts. Not included are losses in jobs at the local service station, trucking company, or supermarket (indirect economic effects associated with reduced production). These are higher for more integrated industries. Compared to other industries in Montana, timber industry jobs are relatively high-paying jobs. Loss of high-paying jobs will make the State even poorer.

The prices of wood products are highly cyclical. At the heart of the cyclical nature of these markets is the Federal Reserve Board and monetary policy in the United States. The housing industry has been a counter cyclical part of the larger cycles of economic activity. As the economy speeds up and inflationary pressures increase, the Federal Reserve Board pursues an anti-inflationary policy with higher interest rates. The Federal Reserves' anti-inflationary policy translates into higher mortgage rates, slower construction activity, and weaker timber markets. When economic activity slows, the Federal Reserve Board loosens monetary policy to stimulate expansion and growth.

The calculated stumpage prices shown in TABLE H-2-ESTIMATED REVENUES AND

TABLE H-3 - EMPLOYMENT AND EARNINGS IMPACTS⁷

	DIRECT EMPLOYMENT	EMPLOYMENT INCOME
Alternative A	0	0
Alternative B	64.3	\$2,048,984
Alternative C	56.8	\$1,809,989
Alternative D	56.2	\$1,790,869
Alternative E	61.2	\$1,950,199
Alternative F	47.5	\$1,513,635

⁷These income and employment estimates should be interpreted as occurring within recent ranges of overall employment.

EXPENDITURES FOR ALTERNATIVES B, C, D, E, AND F are based on average market conditions for the last 2 years. Stumpage prices peaked in 1993 and have fallen steadily since. Since the Federal Reserve Board recently relaxed interest rates, we expect that market conditions will bottom and start to improve. Thus, the prices we used should be a good reflection of the prices paid for the timber when harvested.

SOME INDIRECT IMPACTS ON THE SCHOOL TAX REVENUE BASE

School finance in Montana is a very complex issue. Not only do school funds come from resource income, they also come from the property tax base in local school districts and the State general fund in the form of State support to local school districts. Thus, the South Wood Timber Sale Project has indirect, as well as direct, school-revenue implications. This section summarizes some of the indirect impacts of financial support of Montana's common schools.

The timber industry is a major component of the property tax base in many counties and school districts in Montana. TABLE H-4 - **TAXABLE PROPERTY VALUE...** only partially documents the role of the industry in some important Montana counties. For example, the assessed value of the land, buildings, improvements, furniture, and equipment of 4 companies in Missoula County was about \$195 million in the year 2000. This value is about 5 percent of the entire assessed property value for all taxpayers in Missoula County. Thus, of the thousands of property taxpayers, 4 taxpayers account for 5 percent of the tax base. A similar situation is depicted for Lincoln County during the year 2000. However, the tax base of Flathead County included the now-defunct American Timber Company. This coming year, the assessed value will drop some \$4.4

million as a result of this closure, or a reduction of the equivalent of 4 kindergarten-through-12 students. But this measure of dependency only tells part of the story. The reliance on Smurfit Stone Container by the Frenchtown School District or the dependence of the Bonner School District on Stimson Lumber Company is far greater. The potential loss of a large, highly valued business has substantial property tax implications at both the county and local school district level of taxation.

The values in **TABLE H-4 - TAXABLE PROPERTY VALUE...** are misleading in other important ways. Also important from the standpoint of property taxes is logging and transportation equipment. Logging and log-hauling equipment, as well as special rail cars, are excluded from **TABLE H-4- TAXABLE PROPERTY VALUE...** because they are difficult to identify in the Montana Department of Revenue records. For example, a log truck might be carried in the Montana Department of Motor Vehicles tax records. From the standpoint of property values, many smaller businesses are also excluded from the data in **TABLE H-4- TAXABLE PROPERTY VALUE...**. For example, Ravalli County is famous for its log home industry. Because log homes are labor intensive relative to the production of paper or other products, these business are not reported in **TABLE H-4- TAXABLE PROPERTY VALUE...**.

Next, we will estimate the school support generated by workers in the wood-product industry as a result of the income taxes and property taxes they can be expected to pay (see **TABLE H-5 - PERSONAL INCOME AND PROPERTY TAX REVENUES GENERATED**).

Clearly, the workers themselves will contribute to school support from their earnings. **TABLE H-5-PERSONAL INCOME AND PROPERTY TAX REVENUES GENERATED** estimates the income and

TABLE H-4 — TAXABLE PROPERTY VALUE OF WESTERN MONTANA WOOD-USING INDUSTRY
(MILLS WITH TAXABLE VALUES GREATER THAN \$1,000,000)

COUNTY	ASSESSED VALUE ⁸	TAX-BASE DEPENDENCY ⁹	NUMBER PAYERS	ESTIMATED SCHOOL TAXES ¹⁰	KINDERGARTEN THROUGH 13 EQUIVALENTS
Lincoln ¹¹	29,852,607	.05	6	289,005	29
Flathead	86,233,339	.02	3	559,638	93
Sanders	8,726,746	.01	3	49,323	8
Lake	19,377,972	.02	1	107,816	18
Missoula	194,896,399	.05	4	1,246,387	208
Mineral	1,878,490	.01	1	14,290	2
Broadwater	3,207,804	.01	1	9,610	2
Park	8,726,746	.01	1	38,884	6
Rosebud	3,696,409	.00	1	6,640	1
Gallatin	4,993,905	.00	1	28,257	5
Powell	6,845,451	.02	1	40,042	7
TOTALS			23	\$2,274,290	379

⁸Specific assessed values on these firms are based upon spreadsheet data, made available by the Montana Department of Revenue, and reflect values for the year 2000.

⁹Tax dependency is calculated by dividing the timber-industry assessment by the total-property assessment in the county.

¹⁰These estimates are based on the average mill levy in each county and the portion of the total property tax in the county that is devoted to local schools (Montana Department of Revenue).

¹¹The Lincoln County total includes a 4.4 million assessed value for the now defunct American Timber Company.

TABLE H-5—PERSONAL INCOME AND PROPERTY TAX REVENUES GENERATED

	NO JOBS	MONTANA INCOME TAX ¹²	RESIDENTIAL PROPERTY TAX ¹³	EQUIVALENT KINDERGARTEN THROUGH 12 STUDENTS ¹⁴
Alternative A	0	0	0	0
Alternative B	64.3	\$89,345	\$43,740	22
Alternative C	56.8	\$79,366	\$38,340	20
Alternative D	56.2	\$78,527	\$37,935	19
Alternative E	61.2	\$85,514	\$41,310	21
Alternative F	47.5	\$66,371	\$32,063	16

¹²The income taxes are likely a conservative estimate, as it is assumed that the wood products industry worker is the sole earner in the household. Estimates of taxes paid were made for workers in the seventh decile of earning in Montana based on Montana Department of Revenue data.

¹³The estimate of property taxes paid was made on the basis of the total residential property taxes paid divided by the number of income tax filers in Montana. This relied on Montana Department of Revenue data.

¹⁴In calculating these kindergarten-through-12 equivalencies, it was assumed that all the property and income taxes would go to the schools.

property taxes that would be generated by the workers employed in the 5 South Wood Timber Sale Project alternatives.

Montana timberland tax calculations utilize an annuity formula applied to different land-productivity classes and different market areas in the State. The timber values that enter the annuity formula are updated periodically. Higher prices mean higher taxes and lower prices mean lower taxes. When sawmills such as American Timber Company close, there are fewer potential timber bidders; other things equal, this will lower property taxes in Montana.

Based on the assessed value of timberland in the year 2000, the average mill levy in each county, and the proportion of property taxes that are devoted to the local schools, the timberland property taxes in Montana support an estimated 270 student equivalents.

Given the information concerning the contribution of the timber industry to property tax values, taxes, and income, it is important to summarize both the direct and indirect impacts of the 5 alternatives on school finance in Montana. TABLE H-6 - *KINDERGARTEN-THROUGH-12 STUDENT-EQUIVALENT IMPACTS-A SUMMARY* synthesizes the effects. In estimating the impacts, it is necessary to estimate the total Statewide harvest since the published reports for the year 2000 harvest levels will not be available until the fourth quarter of this (2001) year. Given the estimated level of total timber harvests and the expected harvest level for each alternative, the Statewide estimates of kindergarten-through-12 student equivalencies can be apportioned to each of the South Wood Timber Sale Project alternatives. It may appear that the indirect revenue effects are small. Of course, property and income tax revenues are not limited to school expenditures. The portion

of total property taxes allocated to local schools varies among Montana counties. In the 21 counties examined in *TABLE H-7 - TIMBER PROPERTY TAXES FOR MONTANA IN THE YEAR 2000*, the portion of the property tax revenues going to county schools ranged from 31 to 49 percent.

However, *TABLE H-6 - KINDERGARTEN-THROUGH-12 STUDENT-EQUIVALENT IMPACTS-A SUMMARY* establishes that important additional kindergarten-through-12 equivalencies are produced beyond those generated by direct timber sale receipts. For each alternative (other than No-Action Alternative A), an additional 23 to 27 kindergarten-through-12 student equivalencies are produced from large mill property taxes, worker residential property and income taxes, and timberland property taxes. The total large mill property tax in *TABLE H-4- TAXABLE PROPERTY VALUE...* and Timber Property Tax in *TABLE H-6-KINDERGARTEN-THROUGH-12 STUDENT EQUIVALENT IMPACTS-A SUMMARY* were apportioned to this project by taking the estimated volume for each alternative as a percentage of an estimated 805 MMBF Statewide harvest for the year 2001. The worker income and property taxes were not apportioned in a similar way since these were treated as marginal values rather than average values.

CUMULATIVE EFFECTS

Economic cumulative effects are tied to income from timber management on State trust lands in this analysis. The South Wood Timber Sale Project, if implemented, would provide for a portion of the total income earned from those lands. In FY 2000 (July 1, 1999 to June 30, 2000), DNRC earned a total income of \$12,710,311 from forest-management activities. For every dollar DNRC spent in forest management, DNRC earned \$2.78 in return. Therefore, the cost to

TABLE H-6 - KINDERGARTEN-THROUGH-12 STUDENT-EQUIVALENT IMPACTS-A SUMMARY¹⁵

ALTERNATIVE	DIRECT REVENUE (TABLE E-1)	LARGE MILLS PROPERTY TAX (TABLE E-4)	WORKER INCOME AND PROPERTY TAX REVENUE (TABLE E-5)	TIMBER PROPERTY TAXES (TABLE E-7)	TOTAL
A	0	0	0	0	0
B	298	3	22	2	325
C	195	2	20	2	219
D	200	2	19	2	223
E	218	3	21	2	244
F	175	2	16	2	195

¹⁵All kindergarten-through-12 (K-12) student equivalencies, are rounded to the nearest whole student. The year 2000 harvest was estimated with the equation $3,439,500 - 2,636 \cdot \text{year}$. The year 2000 was coded with a value of 100.

TABLE H-7-TIMBER PROPERTY TAXES FOR MONTANA IN THE YEAR 2000

COUNTY	ASSESSED VALUE	TAXABLE VALUE	ESTIMATED LOCAL SCHOOL SUPPORT	STUDENT EQUIVALENTS
<i>Northwest</i>				
Lincoln	\$245,559,535	\$1,399,724	\$ 227,340	38
Flathead	\$269,866,018	\$1,538,260	\$ 275,241	46
Lake	\$ 55,699,197	\$ 317,475	\$ 48,701	8
Sanders	\$160,142,867	\$ 912,812	\$ 142,243	24
Subtotal	\$731,267,617	\$4,168,271	\$ 693,525	116
<i>Western Montana</i>				
Missoula	\$219,928,312	\$1,253,625	\$ 219,272	37
Mineral	\$ 41,445,162	\$ 236,227	\$ 49,545	8
Ravalli	\$ 35,312,126	\$ 201,343	\$ 25,316	4
Granite	\$ 56,158,010	\$ 320,121	\$ 42,725	7
Subtotal	\$352,843,610	\$2,011,316	\$ 336,858	56
<i>Westcentral Montana</i>				
Broadwater	\$ 8,189,846	\$ 46,678	\$ 4,300	1
Cascade	\$ 11,290,405	\$ 64,345	\$ 10,838	2
Jefferson	\$ 8,312,555	\$ 47,374	\$ 6,484	1
Judith Basin	\$ 1,892,131	\$ 10,797	\$ 1,479	0
Lewis and Clark	\$ 42,604,839	\$ 242,836	\$ 94,946	16
Meagher	\$ 32,325,975	\$ 184,257	\$ 21,353	4
Powell	\$ 91,353,693	\$ 520,711	\$ 95,302	16
Subtotal	\$196,005,444	\$ 932,741	\$ 234,702	40
<i>Southwestern Montana</i>				
Beaverhead	\$ 5,935,731	\$ 33,837	\$ 6,378	1
Deerlodge	\$ 22,374,293	\$ 127,538	\$ 23,504	4
Gallatin	\$ 56,046,375	\$ 319,519	\$ 135,073	23
Madison	\$ 22,642,805	\$ 129,035	\$ 19,181	3
Park	\$ 43,495,978	\$ 247,924	\$ 34,518	6
Silver Bow	\$ 4,576,468	\$ 26,086	\$ 6,330	1
Subtotal	\$155,071,650	\$ 883,939	\$ 224,984	38
Totals for the 4 regions	\$1,435,188.321	\$7,996,267	\$1,490,069	250
Montana totals	\$1,527,868,245 (est.)	\$8,708,849	\$1,622,856	270

implement DNRC's management program was \$4,572,054 in FY 2000; DNRC's net earnings were \$8,138,254. These figures change from year to year. The Statewide average revenue to cost ratio for FY 1994 through FY 1999 was 2.68, 2.07, 1.68, 1.89, 1.72, and 1.36, respectively, for each year (*DNRC Monitoring Report, SFLMP, FY 1994-2000*). These ratios may increase or decrease in the future as a result of changes in market conditions or the actual amount of timber harvested and paid for. DNRC anticipates continuing to earn a profit from its forest-management program.

COMMENTS ON THE SCOPE OF ECONOMIC ANALYSIS

Nonmarket costs and benefits are not examined because they do not contribute to the returns to the trust under the trust mission of State lands. These costs and benefits can be important in the sense of the larger social economy. However, most attempts to calculate

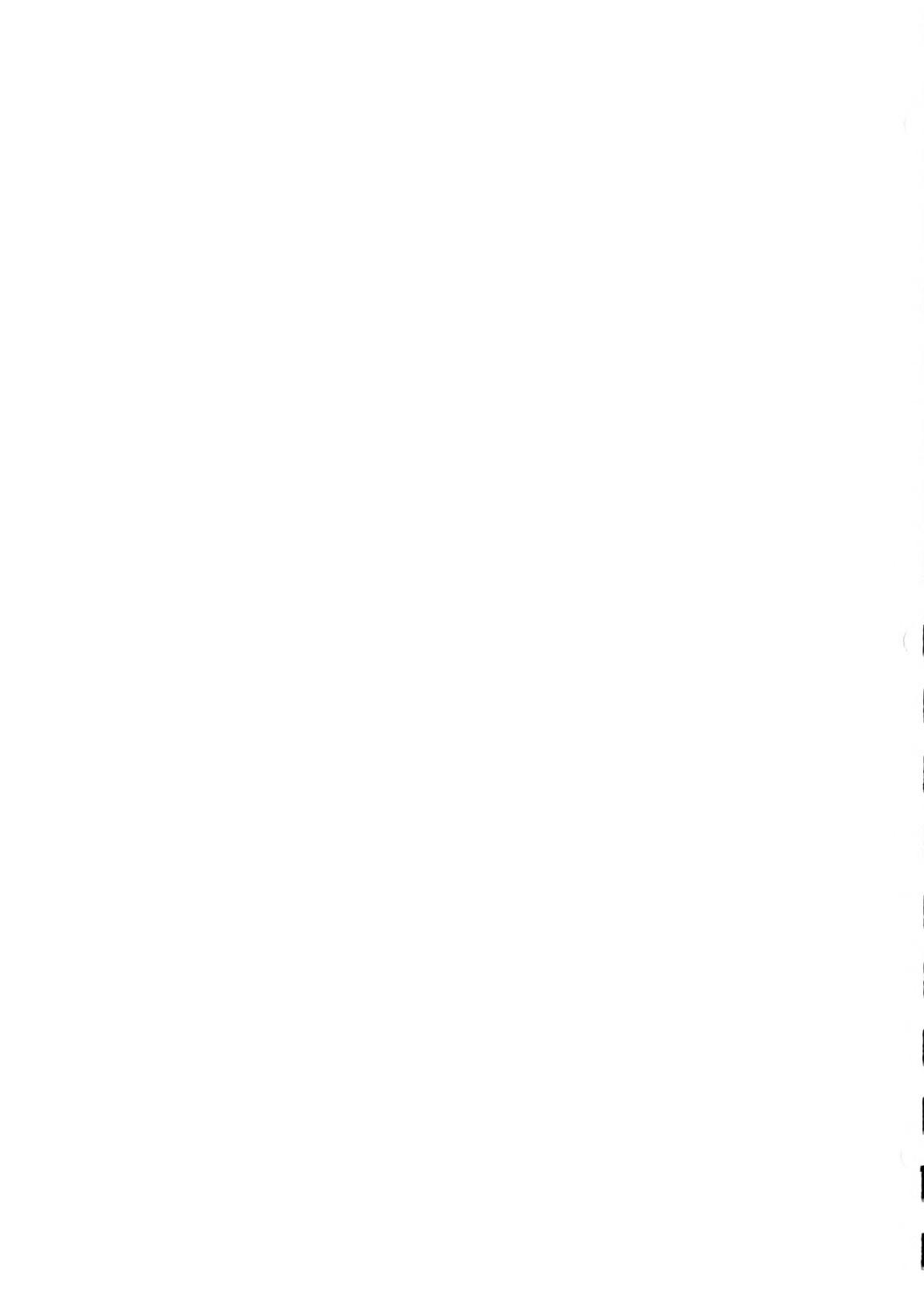
nonmarket costs and benefits rely on the concept of the "willingness to pay". Because the willingness to pay does not typically translate into actual compensation to the trust when real market earnings are foregone, nonmarket estimates of the willingness to pay are largely irrelevant.

DNRC has a Statewide sustained-yield harvest-volume level of 42.164 MMBF per year. If the timber from this project is not sold, timber could be offered from other DNRC projects to meet the sustained yield volume.

Finally, it is important to mention that these alternatives have not examined long-term discounted costs and benefits because the alternative were developed under the Statewide forest plan. The analysis is intended to provide a good comparison of the relative merits of the alternatives. They are not intended to be used as absolute estimates of returns.



Money earned from selling timber sales is deposited into the school trust. The money from the school trust is used to operate schools and educate children.



SOUTH WOOD TIMBER SALE PROJECT

RECREATION ANALYSIS APPENDIX I

INTRODUCTION

The South Wood Timber Sale Project area currently experiences light recreational use by the general public.

METHODS

The methodologies used to portray the existing condition and determine recreational impacts of the project include determining the recreational uses, approximate action of revenue, and the potential for conflict between project activities and recreational uses.

ANALYSIS AREA

The analysis area includes all legally accessible lands within the South Wood Timber Sale Project area (South Woodward and Woodward Creek watersheds) and the roads that would be used to haul equipment and logs.

EXISTING CONDITION

The South Wood Timber Sale Project area receives light recreational use

throughout the year. The area is primarily used for berry picking, snowmobiling, bicycling, fishing, hiking, hunting, and some camping. Fatty Creek Road is used as a primary access route to the northern portion of the Mission Mountain Wilderness area and South Woodward drainage. Whitetail Road provides access to the Woodward, Whitetail, and Porcupine drainages.

One hunting outfitter license is issued for Swan River State Forest and encompasses the project area. The annual rental fee is approximately \$5,200.

State lands are available for nonmotorized recreational use to anyone purchasing a General Recreational Use License for State lands. Licenses are not site specific and allow use of all legally accessible State lands; therefore, it is very difficult to determine the amount of recreational use and income resulting from the sale of licenses for a specific area. From July 1, 1999 to June 30, 2000, the total gross revenue to the school trust from General Recreational Use Licenses was \$381,740. There are approximately 5,157,380 acres of school trust land Statewide (*DNRC Annual Report 2000*). Therefore, the average gross revenue is approximately \$.074/acre (\$381,740 divided by 5,157,380 acres) for FY 2000. Applying the

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Statewide average revenue per acre to the State land within the project area (approximately 16,000 acres), the lands produced an estimated revenue of \$1,184 from General Recreational Use Licenses, assuming the project area receives an average amount of paid recreational use.

DIRECT EFFECTS

- ***Direct Effects of No-Action Alternative .1***

Recreational uses and revenue would not change from what now exists.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F***

Harvesting activities may disturb normal game-movement patterns, which may affect hunter success. Short delays due to log hauling, snowplowing, and road-construction may inconvenience snowmobilers, bicyclists, and other recreationists. However, recreational use and revenue income from outfitting and General Recreational Use Licenses are not expected to change with the implementation of this project.

The open, restricted, and closed road status would not change with the implementation of this project.

INDIRECT EFFECTS

- ***Indirect Effects of No-Action Alternative .1***

No change to the existing condition is anticipated.

- ***Indirect Effects Common to Action Alternatives B, C, D, E, and F***

The amount of recreational use within the project area may change. Recreational users may use adjacent areas to avoid harvesting and log-hauling activities. Recreational use and revenue income from outfitting and General Recreational Use Licenses are not expected to change as this project is implemented.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action Alternative .1***

Some recreational users may be reluctant to use roads within the project area if roads continue to deteriorate. However, recreational use and revenue income from outfitting and General Recreational Use Licenses are not expected to change.

- ***Cumulative Effects Common to Action Alternatives B, C, D, E, and F***

The combined harvesting and log-hauling activities of this project and Plum Creek Timber Company within the project area may displace recreational use to adjacent areas outside the project area. All levels of existing recreational use on Swan River State Forest are expected to continue. Therefore, revenue income from outfitting and General Recreational Use Licenses is not expected to change.



SOUTH WOOD TIMBER SALE PROJECT

AIR QUALITY APPENDIX J

INTRODUCTION

Air quality could be affected by smoke from project-related logging slash and prescribed burning. Air quality may also be affected by the road dust created by harvesting and log-hauling activities.

METHODS

The methodologies used to analyze effects to air quality include estimating the location, amount, and timing of smoke and dust generated by project-related activities.

ANALYSIS AREA

The analysis area for air quality includes all of Lake County, which is a part of Montana Airshed 2 as defined by the Montana Airshed Group.

EXISTING CONDITION

Currently, the project area contributes very low levels of air pollution into the analysis area or

local population centers. Temporary reductions to air quality from the project area exist in the summer and fall due to smoke generated from prescribed burns and dust produced by vehicles driving on dirt roads. None of the air-quality reductions affect local population centers beyond EPA standards. All burning activities by major burners comply with emission levels authorized by the Montana Airshed Group. The project area is outside any of the local impact zones, where additional restrictions may be imposed to protect air quality.

DIRECT EFFECTS

• *Direct Effects of No-Action Alternative I*

The existing condition would not change.

• *Direct Effects Common to Action Alternatives B, C, D, E, and F*

Postharvest burning would produce smoke emissions; log hauling and other project-related traffic on dirt roads would increase road dust during dry periods. No increase in emissions is expected to exceed standards or impact local population centers provided that the burning is completed within the requirements imposed by the Montana Airshed Group and dust abatement is applied to roads during dry periods.

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INDIRECT EFFECTS

- ***Indirect Effects of No-Action, Alternative A***

The existing condition would not change.

- ***Indirect Effects Common to Action Alternatives B, C, D, E, and F***

Since emissions are expected to remain within the air-quality standards, no indirect effects to human health at local population centers are anticipated.

CUMULATIVE EFFECTS

- ***Cumulative Effects of No-Action, Alternative A***

The existing condition would not change.

- ***Cumulative Effects Common to Action Alternatives B, C, D, E, and F***

Additional smoke produced from prescribed burning on adjacent USFS, private industrial forest lands, and State school trust lands would remain within the standards for air quality, but the cumulative effects during peak burning periods could affect individuals with respiratory illnesses at local population centers for short durations. All known major burners operate under the requirements of the Montana Airshed Groups, which regulate the amount of emissions produced cumulatively by major burners.



During periods when burning does not take place, the air quality in the project area is good.



Dust and smoke would be in the air temporarily during the periods of log hauling and slash burning.



SOUTH WOOD TIMBER SALE PROJECT

AESTHETICS APPENDIX K

INTRODUCTION

The visual effects on the project area are considered because the visual character is the most noticeable component of "aesthetics". The aesthetics analysis focuses on those areas where the timber harvesting activities are proposed. The views of the harvest proposal will be provided in reference to foreground, middleground, and background. Foreground views are immediately adjacent to a road or trail. Middleground views are 200 to 1,000 feet from a road or trail and usually consist of hillsides and drainages. Background views are of distant horizons, such as mountain ranges or valleys.

METHODS

Foreground views were analyzed from the open road system within the project area. These views considered:

- disturbance to vegetation and soils from logging and site-preparation activities,
- effects of the silvicultural treatments on the stand structure, and
- the length of treatment along roadways (primarily where people drive, walk, or snowmobile).

Middleground views were analyzed based on examples of similar treatments and mitigations. Sight distances and their relationship to natural processes will be addressed in relation to middleground views.

Background views were analyzed based on the patterns of leave trees within the proposed harvest areas as seen from a distance.

ANALYSIS AREA

The analysis area for the foreground and middleground viewpoints are along the South Woodward, Main Woodward, Whitetail, Woodward Point, and Fatty Creek roads. The analysis area for the background views is the northern Mission Range on the west side of Swan River State Forest as viewed from Highway 83.

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OVERVIEW OF THE PROJECT AREA

The South Wood Timber Sale Project area is under 3 ownerships: Plum Creek Timber Company, USFS, and DNRC. DNRC and USFS ownerships are

FIGURE K-1-VARIOUS VIEWS FROM THE PROJECT AREA



Swan Lake in background as seen from Woodward Point around 1900



Background view of Swan Peak east of the project area



Middleground views



predominantly covered with dense stands of mature coniferous forests similar to those pictured.

Within DNRC ownership there are some areas of past timber harvests. Various timber sales between 1960 and 1992 created these seedtree/clearcut areas ranging in size from 10 to 150 acres. The harvested areas are densely regenerated with 6- to 40-foot trees.

During the past 30 years, the land owned by Plum Creek Timber Company has experienced heavy harvesting, as seen from an aerial photograph containing a portion of the project area. The widespread timber harvesting utilized clearcutting, seedtree harvesting, and selective harvesting. Typically, openings are hundreds of acres. The harvest unit

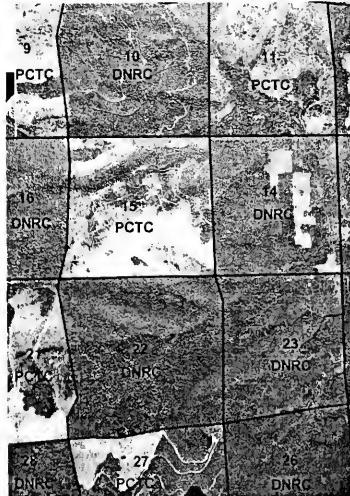


FIGURE K-2-AERIAL PHOTO OF A PORTION OF THE PROJECT AREA

boundaries typically follow section lines and appear harsh and unnaturally straight.

Features of interest within the South Wood Timber Sale Project area are:

- mature, dense stands of timber along several miles of open road;
- legacy trees, relics, or "grandfather" trees, which are predominantly western larch, Douglas-fir, western white pine, and western red cedar in the greater than 25-inch diameter class, which exist individually or in groups primarily in the eastern portion of the project area;
- views of the northwest portion of the Mission Range in the upper part of South Woodward Creek; and
- views of South Woodward and Woodward creeks along open roads in the eastern and southern portions of the project area.

Foreground viewing of the area takes place most often by visitors driving along South Woodward, Main Woodward, Woodward Point, Fatty Creek, and Whitetail roads. Middleground views are available along the Fatty Creek and Whitetail roads and to the east and south across the canyon from South Woodward Road. Background views are available to the west along various points of Highway 83.

DIRECT EFFECTS

- ***Direct Effects of No Action, Alternative I***

In the short-term, vegetation along roadsides would continue to grow and limit views.

- ***Direct Effects Common to Action Alternatives B, C, D, E, and F***

All action alternatives plan some harvesting along roads that are open to vehicle traffic. In these

cases, a visual screen between the road and the harvest unit would be retained. The visual screen would be approximately 100 feet in width, or 1 "sight distance" (the distance at which 90 percent of a animal is hidden from view by vegetation). If harvested under Action Alternative B, this visual screen may not be maintained along open roads where cable logging may be required in Units 12-10, 12-11, 12-24, and 2-20.

Visual screening would not be retained as extensively in harvest units adjacent to roads that have restricted vehicle traffic. Roadside vegetation, healthy smaller noncommercial trees, and trees designated for leave would be retained to partially screen harvested areas from these roads. The topography may limit some views into harvested areas from restricted and open roads adjacent to cable logging units.

Harvesting may cause damage to vegetation that is planned for retention. Specifications of the Timber Sale Contract promote careful logging and felling operations and require damaged trees, especially sapling-sized trees, to be felled.

Slash from limbs, tops, and rotten logs, which would accumulate during a harvest operation of this scale, would be visible until grasses, shrubs, and small trees grow enough to visually screen it. Typically, this debris would be left scattered over the ground for up to 1 year to return nutrients from the needles to the soil. Also, retaining 10 to 15 tons (about half of a loaded log truck) of large debris per acre on site to promote long-term soil productivity is recommended. Debris in excess of 10 to 15 tons would be piled and burned. Site preparation for natural regeneration would be accomplished

when units are piled. Skid trails and landings are required to remove logs from harvest units. The effects of skid trails and landings on the landscape depends, in part, on the season of operation; skidding on snow and frozen soil reduces ground disturbance. When soil is disturbed or displaced on skid trails, slash is placed on the disturbed site to cover the area from view and meet BMPs. Landings can be sites of heavy vegetative and soil disturbances that are caused by numerous activities, such as bucking logs, loading logs onto trucks, piling slash, and parking logging equipment. Well designed timber sales focus on limiting the size and number of landings. The landings would be rehabilitated to meet hazard reduction standards and BMPs. Drainage would be incorporated into the landing site to keep the landing dry and reduce rutting. Landings would be grass seeded when the reclamation work is done.

Vegetation damage and soil disturbance, visible as foreground views, would have short-term effects when the following project-design elements and mitigation measures are applied, which include, but are not limited to:

- leaving visual screening along roads that are open to vehicle use;
- felling trees and other vegetation that was damaged during logging;
- bunching and reburning slash piles that did not completely burn;
- limiting the location, size, and number of landings;
- grass seeding disturbed sites; and
- placing slash on skid trails.

The last 3 mitigations are elements of BMPs that help minimize erosion and speed the recovery and revegetation of disturbed soils. They also contribute to short-term recovery to visual effects.

• ***Direct Effects of Action, Alternative B***

This alternative uses a seedtree harvest with group and individual tree retention. Where available, 6 to 10 trees per acre of healthy western larch, Douglas-fir, and western white pine would be retained. Some clumps of healthy, submerchantable western red cedar understory would be retained. Harvesting would aesthetically affect the area by removing mature trees and opening the view. Many current foreground views would become middleground views along restricted roads and where harvest units of cable logging are adjacent to open roads. Middleground views would look similar to Examples of seedtree harvests on page 5.

Alternative B would not be viewed as background from Highway 83 because harvest units are close to the valley floor and screened by existing timber walls.

• ***Direct Effects of Action, Alternative C and D***

These alternatives use a commercial thin harvest that strives to retain about 100 trees per acre of healthy western larch, Douglas-fir, and western white pine. Also, some clumps of healthy, submerchantable western red cedar understory would be retained. Harvesting would aesthetically affect the area by removing some mature trees and opening the view from restricted roads. Middle and foreground views would be similar to Examples of commercial-thin harvests on page 5.

Current foreground views would have fewer trees; however, in many cases, the views would not change to allow middleground views. If there were not enough suitable retention trees in some areas of the stand, openings would occur and cause some foreground views to become middleground views.

Both alternatives are viewed as background from Highway 83. Harvested stands would have fewer trees and, in some areas, small 1- to 2-acre openings.

Examples of seedtree harvesting



• Direct Effects of Action Alternatives E and F

Action Alternatives E and F use a combination of seedtree and commercial-thin harvests.

Seedtree units would retain groups and individual trees. Where available, 6 to 10 trees per acre of healthy western larch, Douglas-fir, and western white pine would be retained. Some clumps of healthy, submerchantable western red cedar understory would be retained. Harvesting would aesthetically affect the area by removing mature trees and opening the view. Many current foreground views would become middleground views along restricted roads.

The commercial-thin harvest units strive to retain about 100 trees per acre of healthy western larch, Douglas-fir, and western white pine. Also, some clumps of

Examples of commercial-thin harvests



healthy, submerchantable western red cedar understory would be retained. Harvesting would aesthetically affect the area by removing some mature trees and opening up the view from restricted roads. Current foreground views would have fewer trees; however, in many cases, the views would not change to allow middleground views. If there were not enough suitable retention trees in some areas of the stand, openings would occur. This would cause some foreground views to become middleground views.

Action Alternatives E and F have units that are viewed as background from Highway 83. The commercial-thin harvest units would have fewer trees and, in some areas, small 1- to 2-acre openings. Seedtree units would not be viewed as background from Highway 83 because harvest units are close to the valley floor and screened by existing timber walls.

INDIRECT EFFECTS

- ***Indirect Effects of No Action, Alternative A***

There are no indirect effects to aesthetics.

- ***Indirect Effects of Action Alternatives B, E, and F (Seedtree Harvest)***

A treatment of seedtree with retention of groups or individual trees is the primary silvicultural prescription for the seedtree harvest units of these alternatives. Visually, the objective of this treatment is to pattern harvest areas after a mixed-severity or stand-replacement fire. This would:

- leave jagged edges between cut and uncut areas; another way to describe this is that fires often create burn "fingers."

- feather some edges by leaving more trees per acre along the unit boundary; along the edge of a fire, the fire usually burns with less intensity, allowing more trees to survive.
- wherever possible, utilize existing stand boundaries for the boundaries of harvest units to take advantage of natural patterns already on the landscape.
- leave groups of trees as if the fire burned around or lightly through areas; areas with springs and/or quality wildlife trees and snags would be left to give this appearance.
- leave scattered trees that may naturally have survived the fire, such as thick-barked western larch and Douglas-fir.
- create larger openings with a few live trees per acre.

- ***Indirect Effects of Action Alternatives C, D, E, and F (Commercial-thin Harvest)***

The commercial-thin harvest units would attempt to leave an even distribution of about 100 trees per acre (approximately 20-by-20-foot spacings) across the landscape. Visually, the objective of this treatment is to pattern harvest areas after a low-intensity, mixed-severity burn. Western larch and Douglas-fir would be the preferred species for leave trees as they would be the most likely to survive a low-intensity burn. However, in areas where western larch and Douglas-fir are absent, other species of trees that are not likely to survive low-intensity burns would be left. Harvest areas would not be as visually noticeable as seedtree units due to the amount of canopy being retained.

CUMULATIVE EFFECTS

• Cumulative Effects Common to All Alternatives

Natural processes on the landscape, such as wildfires, blowdown events, insect infestations, or disease infections would continue to alter the visual resource over time.

In the short-term, effects to the visual resource would be from present activities, such as firewood gathering, continued timber harvesting on adjacent Plum Creek Timber Company lands, and continued timber and salvage harvesting on DNRC ownership.

Salvage and firewood harvesting would alter foreground viewing by damaging vegetation along roads. Both types of harvesting would leave some debris on road surfaces and in road ditches. The Department administration of salvage permits would keep roadside debris at a minimum. Middleground and background viewing would remain unaltered.

DNRC is planning other harvest projects north of this project in the Whitetail area. Alternatives have not yet been developed for the Whitetail project, but further harvest openings would probably affect viewing in the area. Harvesting will probably continue on adjacent Plum Creek Timber Company ownership. Existing openings will continue to grow, and ownership lines will continue to become more distinct.

SOUTH WOOD TIMBER SALE PROJECT

INITIAL SCOPING MAILING LIST APPENDIX L

Jane Adams
229 Edgewood Drive
Kalispell, MT 59901

Alliance for the Wild Rockies
801 Sherwood
Missoula, MT 59807

Rod Ash
P.O. Box 1129
Condon, MT 59826

Roger Bergmeier
Montana Trust
616 Simons Drive
Missoula, MT 59803

Steve Caldbeck
21201 Buffalo Bridge Road
Big Arm, MT 59910

Kevin Coates, Wildlife Biologist
Department of Fish Wildlife and Parks
490 North Meridian Road
Kalispell, MT 59901-3854

Marcia Cross
Tribal Historic Preservation Office
P.O. Box 278
Pablo, MT 59855

Ann Dahl
Swan Ecosystem Center
6887 Highway 83
Condon, MT 59826

Jim Mann
Daily InterLake
727 East Idaho
Kalispell, MT 59901

Norm Merz, Wildlife Biologist
Northwestern Land Office
2250 Highway 93 North
Kalispell, MT 59901

Neil Meyer
Swan Valley Ad Hoc Committee
52143 Salmon Prairie Road
Swan Lake, MT 59911

Arlene Montgomery
Friends of the Wild Swan
P.O. Box 5103
Swan Lake, MT 59911

Doug Mood
Pyramid Mountain Lumber
P.O. Box 549
Seeley Lake, MT 59868

Bill Moore
P.O. Box 977
Condon, MT 59826

Bud Moore
P.O. Box 1070
Condon, MT 59826

Michael Mortimer
DNRC Legal Counsel
Forest Management Bureau
2705 Spurgin Road
Missoula, MT 59801

Jon Dahlberg, Area Manager
Northwestern Land Office
2250 Highway 93 North
Kalispell, MT 59901

Ecology Center 801 Sherwood Missoula, MT 59801	Kathy O'Connor Forestry Division 2705 Spurgin Road Missoula, MT 59801
William Ensign 700 Rainbow Drive Bigfork, MT 59911	Tom and Melanie Parker P.O. Box 1340 Condon, MT 59826
Jennifer Ferenstein/Rusty Harper State Auditor's Office P.O. Box 4009 Helena, MT 59704	Plum Creek Timberlands Box 567 Seeley Lake, MT 59868
Stan Fisher State Representative P.O. Box 1409 Bigfork, MT 59911	Patrick Rennie DNRC P.O. Box 201601 Helena, MT 59620-1601
Ted Geisey Manager Forestry and Land Programs Northwestern Land Office 2250 Highway 93 North Kalispell, MT 59901	Scott Rumsey Fisheries Biologist Fish, Wildlife and Parks 490 North Meridian Road Kalispell, MT 59901-3854
Randy Gordon Swan Route Bigfork, MT 59911	Gordon Sanders Pyramid Mountain Lumber P.O. Box 549 Seeley Lake, MT 59868
Gary Hadlock, Forest Engineer Northwestern Land Office 2250 Highway 93 North Kalispell, MT 59901	Bill Schultz Supervisor State Land Forestry Division 2705 Spurgin Road Missoula, MT 59801
Chuck Harris Swan Lake Ranger District 200 Ranger Station Road Bigfork, MT 59911	Tom Schultz Forest Management Bureau 2705 Spurgin Road Missoula, MT 59801
Harley Harris Department of Justice P.O. Box 201401 Helena, MT 59620-1401	Lyndee Stevenson P.O. Box 1061 Condon, MT 59826
Patrick Heffernan Montana Logging Association P.O. Box 1716 Kalispell, MT 59901	Tom Tintinger F.H. Stoltze Land and Lumber Company P.O. Box 1429 Columbia Falls, MT 59912
Tony Nelson Hydrologist/Fisheries Biologist Northwestern Land Office 2250 Highway 93 North Kalispell, MT 59901	Cary Hegreberg Montana Wood Products Association 2027 11th Avenue Helena, MT 59601-4875

Caesar Hernandez
Montana Wilderness Association
Northwest Field Office
43 Woodland park Drive #9
Kalispell, MT 59901

Galen Hollenbaugh
Department of Justice
P.O. Box 201401
Helena, MT 59620-1401

Tony M. Hulett Logging
P.O. Box 5102
Swan Lake, MT 59911

Joe Kerwin
Secretary of State's Office
P.O. Box 202801
Helena, MT 59620-2801

Joe Lamson
Office of Public Instruction
P.O. Box 202501
Helena, MT 59620-2501

Julie Lapeyre, Policy Advisor
Governor's Office
Rom 204, State Capitol
P.O. Box 200801
Helena, MT 59620-0801

Kyle Luckow
71232 Highway 83
Bigfork, MT 59911

Steve Thompson
Natural Resource Consultant
P.O. Box 4471
Whitefish, MT 59937

Peggy Wagner
Montanans for Multiple Use
P.O. Box 68
Hungry Horse, MT 59919

Allen Wolf, Silviculture Supervisor
Northwestern Land Office
2250 Highway 93 North
Kalispell, MT 59901

William Wood, Forest Economist
Forestry Division
2705 Spurgin Road
Missoula, MT 59801

SOUTH WOOD TIMBER SALE PROJECT

APPENDIX M COMMENTS AND RESPONSES

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**FRIENDS OF THE WILD SWAN
P.O. BOX 5103
SWAN LAKE, MT 59911**



May 9, 2001

Swan River State Forest
Attn: Dan Roberson
58741 Hwy 83 South
Swan Lake, MT 59911

Dear Mr. Roberson:

Please accept the following comments on the South Wood Timber Sale Project Draft Environmental Impact Statement on behalf of Friends of the Wild Swan, Alliance for the Wild Rockies and The Ecology Center. Overall this project continues to fragment habitat for threatened, endangered and sensitive species as well as degrades water quality and native fish habitat by logging old-growth and increasing road densities.

Watershed

- 1 • State Forest Land Management Plan (SFLMP) Watershed RMS 7 requires DNRC to set a threshold value for cumulative effects that takes into account stream channel stability, beneficial water uses, and watershed condition. The Sediment Source Inventory for South and Main Woodward Creek Watersheds, prepared by DNRC hydrologist John Muirfield in 1998, recommended that the maximum water yield threshold value be 10% in accordance with RMS 7. DNRC, however, has chose to use an allowable water yield increase of 12% (DEIS page D-4) with absolutely no explanation of how that number was arrived at nor why you chose to ignore the recommendation of your resource specialist to use a 10% threshold.
- 2 • The Sediment Source Inventory for South and Main Woodward Creek Watersheds has been referred to in the Appendices to the DEIS as a watershed inventory (Page D-3), watershed assessment (page D-3) and the 1998 sediment source inventory (Page E-2). This is confusing to the reviewer.
- 3 • The DEIS does not disclose the rationale for not completing a detailed watershed analysis (level 3, Watershed RMS 6) especially since this watershed has high resource values and is sensitive to increases in water yield. As a bull trout and westslope cutthroat trout spawning stream, DNRC's arbitrary change in water yield threshold, high sediment levels, predicted erosion levels, checkerboard ownership, past present and future management a detailed watershed analysis is warranted.
- 4 • The DEIS does not acknowledge the uncertainty associated with using the Equivalent Clearcut Area model. In other words, can this watershed, that is already showing damage from past logging and road building actually be brought near the threshold for water yield without causing more damage? What monitoring has been or will be done to validate the assumptions contained in the DEIS? The analysis ignores the effects that road densities have on a watershed such as roads altering the hydrology by intercepting water, channeling it in ditches to culverts which increases the velocity causing bank erosion and sedimentation.

1. Page D-2 of the DEIS states that, "Watershed Resource Management Standards 7 in the SFLMP details the methodology for setting a water-yield-increase threshold. The procedure relies on evaluating the acceptable risk level, resource value, and watershed sensitivity." Resource Management Standard 7 states that, "To comply with the RMS, allowable water yield increases in the Stillwater, Coal, and Swan State Forests will be limited to levels which pose a low degree of risk to the beneficial water uses and watershed values." Figure 1 of Resource Management Standard 7 was used to determine the water-yield threshold. No documentation of use of Figure 1 was found for the 10-percent value recommended in 1998.

2. The EIS will be revised so that all references are to, "sediment source inventory."
3. Each of the factors used in Watershed Resource Management Standard 6 were used to determine the appropriate level of the cumulative-effects analysis, including extent of proposal, level of past activity, and values at risk. Based on these factors, a level 3 analysis was completed. Comprehensive field evaluations were completed through the detailed sediment-source inventory to determine the existing watershed conditions (DEIS, pages III-18 and D-1 through D-3) and model simulations of watershed response to disturbance (DEIS, pages III-18 through III-20, D-2, D-4 and D-5, and D-9 through D-12). Other indicators of cause-and-effect relationships were discussed in reference to stream-crossing removals, rehabilitations, replacements, and road construction/reconstruction (DEIS p. III-18 through 20 and D-1 through 9).

4. DNRC readily acknowledges that there is a degree

- 8 so how much? Does the fisher buffer also function as the SMZ?
- 9 • The DEIS does not disclose the monitoring strategy to assess watershed impacts of land use activities and the effectiveness of mitigation measures as required in Watershed RMS 20.
- 10 • The DEIS does not disclose why DNRC believes that replacing existing culverts with 50 year flood event sized culverts is adequate to protect fish habitat and water quality in the Woodward Creek watershed and Swan Lake.
- 11 • The DEIS did not analyze an alternative that removed culverts (and did not replace them) and permanently reclaimed roads to improve water quality and provide secure habitat for wildlife.

Fisheries

- DNRC has ignored the recommended strategy contained in the *Relationship Between Land Management Activities and Habitat for Bull Trout* that was an important component to the Montana Bull Trout Restoration Team's development of a Bull Trout Restoration Plan. This strategy was adopted so as not to impose "one size fits all" rules but rather to apply an adaptive management approach which would include monitoring habitat components, criteria based standards and delineation of caution zones. The South Wood Project does not delineate caution zones on the streams in the Woodward Creek watershed and does not monitor the components contained in Table 3 of the Land Management Plan (other than fine sediment and redds counts which is routinely done by Fish, Wildlife and Parks).

Activities that occur within the "caution zone" (i.e., 100 year floodplain plus 150 feet on either side and/or the hydrologic boundary of the watershed) may inherently pose some risk and should not occur unless sufficient information is available to reliably demonstrate that the activity will not adversely affect habitat characteristics necessary to support bull trout. As stated in comments above it is unclear how big an SMZ has been delineated, whether activities will take place in the caution zone, what mitigation will be used and what monitoring will be done to ensure that it works.

- Woodward Creek is a core area for bull trout and also contains spawning area for westslope cutthroat trout. Alternatives B, C and E all increase the risk of delivering fine sediment to a spawning stream from logging. Construction of new roads was not analyzed. DNRC concludes that since no egregious sediment sources were identified than there are no effects from past management. This ignores the fact that fine sediment is at threshold levels, road densities in the watershed are very high. 21% of the watershed has already been logged and water yield has increased to 8%. (Page E-7)

- The matrix on page E-8 discloses that DNRC intends to maintain degraded conditions and/or further degrade bull trout habitat. This not only violates Threatened and Endangered Species RMS 1, but is illegal under the Endangered Species Act. The state of Montana has crafted a Restoration Plan for bull trout yet DNRC actions do no restore already degraded conditions.

Goal Objective 1 of the Montana Restoration Plan: Protect existing population within ALL core areas and maintain genetic diversity represented by those remaining local populations. Maintaining degraded habitat and/or further degrading habitat is not consistent with this goal.

- DNRC needs to reconcile differences between this EIS and the Watershed Biological Assessment prepared by the Flathead National Forest to comply with its ES? *revisions for consultation with USFWS*. This information forms the baseline

of uncertainty in the use of any model to describe complex hydrologic and ecological processes. The relationships are based on research, and are outlined in *Forest Hydrology, Part II (1976)* as stated in the DEIS, page D-2.

According to the sediment-source inventory completed in 1998, "Stream reaches are generally considered stable, with ample levels of LWD (large woody debris) and natural grade breaks that aid in stream energy dissipation." The inventory also reports, "Initial results of the upland sediment source inventories in both the South and main Woodward Creek drainages indicate that roads are not contributing significant levels of sediment to stream crossings." This report is referenced in the DEIS, pages III-18 and D-1 through 4. There was no evidence found in this inventory or in subsequent field reconnaissance that the watershed is, "already showing damage from past logging and road building". The procedures for establishment of a threshold of concern are described in the DEIS, page D-2. These procedures took the findings of the sediment-source inventory and field reconnaissance into account in order to set a threshold below where there is a low risk of in-channel erosion or destabilization of banks. Research indicates that, "Reductions in forest cover of less than 20%... apparently cannot be detected by measuring streamflow, that is, by what has been termed the 'hydrometric method.'" (Bosch & Hawlett, 1982) All action alternatives keep the watershed in a less-than-20-percent equivalent clearcut condition. Therefore, changes in water yield at this level of harvesting would not be measurable in Woodward Creek. If water yield increases are insufficient to measurably increase stream flow, it is highly unlikely that stream stability would result from

water yield increases.

watershed condition. The Watershed BA determined that pool frequency, pool quality and large pools were functioning at an unacceptable risk. DNRC determined they were functioning at risk. The BA determined that streambank condition, riparian habitat conservation areas, and peak and base flows were functioning at risk. DNRC determined they were functioning properly. The BA determined that the drainage network, disturbance history and disturbance regime were functioning at unacceptable risk. DNRC determined that they were functioning properly. What did DNRC use to make its determinations? How and when was it collected? Why wasn't it available to the public?

Economics¹⁶

• NEPA requires the DNRC to conduct a comprehensive economic analysis to determine the costs and benefits of proposed timber sales. Only if there is a positive cash flow from the sale is the state allowed to proceed. The DEIS mentions the revenue on pages H-1 and H-3 but ignores the costs when discussing the impacts of this sale on schools.

• The DEIS contains misleading information regarding how schools are actually funded. A DNRC memo acknowledged that the economic analysis, as it relates to classroom benefits is not accurate, yet the DEIS still contains this inaccurate information. For example, that Action Alternative B is estimated to produce slightly more than \$1,789,331 which would purportedly produce enough revenue to send the equivalent of 297 kindergarten through 12 children to school for 1 year without any financial support (see page H-1 and H-3). DNRC knows that trust revenue only supplies a small portion of total school funding and the legislature adjusts school funding from the General Fund to make up any difference. Furthermore, an economic analysis that only discusses the revenue and not the costs and further states that this revenue will educate 297 school children without subtracting the costs is illegal.

• The DEIS does not contain a true cost-benefit analysis. Benefits are expressed as expected gross receipts to the state. These receipts are based upon expected stumpage prices. The report estimates for stumpage prices were based on an average of the USFS' prices for the years 1998-1999 and then adjusted upward based on the GNP deflator. Since the USFS in the Northern Rockies Region 1 recently dropped their prices 40% a more accurate estimate would be based on current USFS volume under contract and then adjusted down by 40%. The DEIS indicates that prices are expected to improve because of recent actions by the Federal Reserve lowering interest rates. There is no mention of NAFTA and Canadian lumber which many economists believe to have the biggest impact on the recent drop in timber prices. Few economists predict that NAFTA will be repealed.

A proper cash flow analysis require costs to include the anticipated investments, stumpage development, maintenance, operating, management, and planning costs attributed to timber production. Stumpage development is mentioned but not included in the total costs on line 9, Table E-2, page H-2.

• The expenditures listed in Table 3-29 on line 9 appear to be incomplete. Please itemize the line item on line 1 titled Forest Improvement. Does it include the cost of preparing the environmental analysis, or the economic analysis by Dr. Jackson or other contacts? Does it include the cost of planning the timber sale? Does it include a share of office expenses and office rent for all those involved in the sale? Does it include vehicle expenses incurred in planning? Does it include a portion of the cost of the DNRC assessments on the sale? Does it include road construction and reconstruction costs,

6. DNRC is not sure which assumptions are referenced. To date, the data from monitoring bull trout and westslope cutthroat trout spawning habitat has been gathered since FY 1997 (DEIS page E-2). This monitoring would continue throughout the contract period and for a minimum of 1 year postharvest. In addition, DNRC is in the process of gathering data on fish habitat for rearing according to the R1/R4 (Overton 1997) procedure. The data will be analyzed and may be duplicated postharvest to determine if the project had any effect on the sampled criteria. In 1976, water-quality gauging was done on South Woodward Creek. No current water-quality sampling is being conducted on Woodward Creek. DNRC also conducts the monitoring of roads and harvest units through internal BMP audits. These audits are conducted under the same format as the Statewide audit process and the results are compiled in the SFLMP monitoring report.
7. All roads in the Woodward Creek watershed were included in the water-yield analysis. The ECA model incorporates the acreage of roads as ECA. The ECA model also accounts for the increase in water yield on roads differently than that from harvest units. This difference reflects the compaction and potential contribution to the drainage network of forest roads. The results of the ECA model are reported in the DEIS, Pages III-18, D-1 and 2 and D-9 through D-12.
8. The width of the SMZ and all management within this zone are determined according to MCA 77-5-301 through MCA 77-5-307, ARM 36.11.310, and procedures defined in the SFLMP Record of Decision, pages ROD-22, 23, and 26.

culvert replacements, bridge removal? MEPA and the state constitution require all anticipated costs to be included.

• The DEIS discusses indirect economic effects when the state previously asserted in the SELMP that the state is only required to maximize cash flow on a particular timber sale and not the indirect affects. The DEIS asserts that the South Wood Timber Sale Project could help keep such large businesses as Smurfit Stone Container and Simpson Lumber from going bankrupt if there is no mention of the impacts of high costs of electricity on these businesses. Recent articles in the Montana newspapers state that high energy costs are the main threats to the timber industry not the supply of timber from state trust lands.

21 • There is no mention of the extent that more intensive timber harvests on state lands degrade the amenities that are drawing people and economic activity to Western Montana. Dr. Thomas Power stated in his report on Montana's State Forests, Schools, Quality of Life: Air Economic Analysis, that 'timber may actually be reducing the support provided to public schools.' The environmental damage caused by the proposed timber sale and its related damage to the economy might more than offset any supposed positive contribution made by the timber workers Dr. Jackson writes about in the report.

22 • DNRC focused its direct analysis on the gross revenue from this proposed sale based on an inflated estimate of timber prices. The report does not discuss the costs when it discusses how many school children would benefit from this sale, only the revenue. When costs are discussed stampage development costs are not counted as part of the total and it is unclear if there is an accurate estimation of the total costs to the state of this proposed sale. This analysis deprives the citizens of the state the complete information necessary to make a rational decision on the management of our school trust lands.

23 • The DEIS failed to analyze opportunity costs or compare what the rate of return would be if the costs for this sale were invested in something else. In other words, what is the next best use for investing that money?

Threatened and Endangered Species

24 • DNRC is in violation of the Swan Valley Conservation Agreement (SVCA) for grizzly bears with its existing open road densities. The SVCA requires a bear management subunit to have no more than 33% Open Road Density (ORD) greater than 1 mile/square mile. The Foreupine/Woodward subunit has an ORD of 39% and DNRC's ownership has a 51% ORD. Total road densities on DNRC's ownership for this subunit are at an astronomical 82% greater than 2 miles per square mile and secure habitat is at a paltry 20%. (1999 Swan Valley Conservation Agreement Monitoring Report) We find it amazing that DNRC is proposing to construct even more roads with every action alternative.

25 • The DEIS does not disclose whether new roads or cutting units are in grizzly bear preferred habitat.

26 • The DEIS does not disclose exactly what its lynx guidance is. The DEIS at page F-8 states that DNRC is updating its guidance to reflect new information, references the Lynx Conservation Assessment, states it hasn't been officially adopted by DNRC but was used in the analysis and then fails to follow the Assessment's standards. DNRC is not planning to meet the 10% recommended level of denning habitat for the lynx. The DEIS notes that 774 acres of denning habitat exist, which is 5%. The lynx conservation strategy requires that if denning habitat is less than 10%, agencies should defer any management actions that will delay development of denning habitat.

No harvesting of timber from within an SMZ is planned with any action alternative.

20 In most cases, the fisher buffer acts in addition to the SMZ. In cases where the fisher buffer is narrower than the SMZ, the SMZ law and rules listed above would take precedence.

9. See response to FOWS 6 above.

10. As stated in the DEIS, pages III-18 and D-3, existing crossing structures are constructed of wood that is rotten and surfaced with soil. These structures are an existing sediment source. Removal and replacement of these structures with a corrugated metal pipe (CMP) designed to carry at least a 50-year-magnitude flood event would eliminate an existing source of sediment and leave a structure with a low probability of failure. The DEIS, pages III-19 and 20 and D-4 through D-11, discloses the effects of replacing the existing CMPS.

11. The DEIS, page I-2, proposes 2 primary objectives that are aimed at improving water quality concerning road drainage and stream-crossing sites. All action alternatives remove and rehabilitate an old bridge site on Woodward Creek. That bridge will not be replaced because it would be very expensive to reconstruct the bridge so it would not be a risk to water quality. Roads that DBRC wishes to permanently abandon within the project area have completely re-vegetated with grass, brush, and young trees; motorized use would be very difficult, if not impossible. Reopening these roads with equipment to remove the culverts would cause an increased risk of sediment delivery to streams.

12. The Relationship Between Land Management Activities and Habitat for Bull Trout (Montana

This project will log high quality old growth, or what appears to be potential denning habitat. This is a violation of the federal direction for conservation of this threatened species. Please disclose whether DNRC has completed its lynx conservation direction and what it is.

27 • DNRC has not defined the habitat in the project area that contains snowshoe hare populations. How can you log lynx habitat without doing this basic habitat analysis? The conservation measures for the lynx cannot be implemented (plan, regeneration harvests, where little or no snowshoe hare habitat exists) without this basic inventory data.

28 • The South Wood DEIS did not define how connectivity for the lynx will be maintained. The lynx conservation assessment requires that habitat connectivity be maintained. Corridors required for old growth (Fister et al. 2000) and recruitment old growth could be used to maintain this connectivity for the lynx as well.

Sensitive Species

29 • ENRC has not defined a conservation strategy for any of the three sensitive species identified in the DEIS (Pileated Woodpecker, Boreal Owl, and fisher). Therefore, the amount of habitat that you have described that currently exists, and will remain after logging, is never assessed as per its ability to maintain viable populations of these species. Could you please define what they need, where these conditions exist in the project area, and in this habitat (current and planned), will maintain viability.

30 • The most current management recommendations for the Pileated Woodpecker recommend large blocks of old growth habitat (2700 acres) to maintain small groups of nesting woodpeckers. These same blocks of habitat would be optimal for the Boreal Owl, which depends upon the Pileated Woodpecker to create nesting cavities. Your old growth strategy does not include any direction for preserving suitable blocks of old growth, and as such, will not address the conservation needs of these species. There is a huge difference between fragmented and effective old growth habitat which you are ignoring.

31 • DNRC has "estimated" which habitats are suitable for the three sensitive species without completing any wildlife surveys in the South Wood project area. Wouldn't it be more reasonable to assume that all habitat is potentially suitable unless you are certain that otherwise? This would be the more conservative approach for vulnerable species. For example, you have ignored the lower elevation needs of the Boreal Owl during the winter, where they have been observed to use lodgepole pine forests. Unless you have data to prove otherwise, it is likely that all dense old growth habitat in the project area has value to all three sensitive wildlife species at some time of the year.

32 • The DEIS infers that Boreal Owls will only nest in stands with alpine fir and spruce. We are not aware of any literature that limits Boreal Owl nesting use to specific tree species. In many areas of its range, it nests in ponderosa pine, western larch, and Douglas fir. On the Beaverhead Forest, this owl will even nest in lodgepole pine (nest boxes). Before you eliminate certain old growth stands as nesting habitat, you need to demonstrate no owl use is possible.

33 • There is no analysis in the South Wood DEIS regarding the contribution that logging old growth on State lands will have to potential declines of sensitive and listed wildlife species in this area. What is the estimated landscape level of old growth in the project area, and is it considered enough for wildlife? • The DEIS has delineated corridors for fisher but where are the core areas of hibernation?

27 • Our recommendations are in the form of a framework rather than a detailed strategy, and do not imply a set process, regulatory mechanisms, or authorities." The guidelines laid out in the MBTSG paper have already defined the "caution zones", which vary according to the parameter monitored. There is no provision, requirement, or suggestion that "caution zones" be located or delineated on the ground or administratively.

The MBTSG paper also states, "Land management activities are not categorically prohibited or restricted within these caution zones by this strategy. However, because activities that occur within the caution zone inherently pose some risk, they should not occur unless monitoring occurs or sufficient information is available to reliably demonstrate that the activity will not adversely affect the habitat components." As stated in the DEIS, pages III-22 and E-2, DNRC is currently implementing spawning habitat monitoring, and has been since before the MBTSG recommendations were issued. As stated in FOWS 6, DNRC is in process of implementing spawning habitat habitat criteria suggested in the MBTSG paper. This monitoring will be completed during the summer of 2001 and be available as a preactivity baseline for comparison should a postactivity survey be completed. FOWS 8 details the SMZ guidelines to be used. Some activities may occur within caution zones, but none would occur within an administrative SMZ under any action alternative. Activities that may occur within a caution zone would be monitored through current DNRC monitoring strategies, which would include recommendations listed by the MBTSG.

13. The construction of new roads was analyzed in the

- Old-Growth Habitat**
- 35 DEIS, pages III-19, D-4, D-6, E-3, E-5, and E-8.
- 36 • As noted in the DEIS at F-2, an old growth network was developed for Swan River State Forest, and these results were used as old growth management decisions for the South Wood project area. Why wasn't any type of public involvement provided for in the process where you determined which and how much old growth to leave in an old growth network? Especially since DNRC committed to the Land Board that NEPA would be done.
- 37 • The DEIS does not provide a summary of the process which was used to select an old growth network from the South Wood project area. Why were certain stands selected, and others discarded? What was the target percentage of old growth you were trying to retain? What quality old growth is in the network?
- 38 • Why didn't DNRC use the network presented to the Land Board in February, 2001 that was based on using the Green et al definition for old-growth?
- 39 • We could not discern whether the effects analysis included impacts to the old-growth network from logging, road building, edge effects, blowdown, etc.
- 40 • Do you have a minimum size and width for old growth stands?
- 41 • Does old growth stand size requirements for old growth require any kind of buffering or old growth stands to retain interior habitat?
- 42 • What is the amount of each attribute type of old growth within the project area, according to your definition of low, medium and high quality? How does this compare to the quality of old growth in the network?
- 43 • How much old growth of each type exists in the project area, and how much of each type will be preserved in your old growth network in the project area?
- 44 • Please provide a map of the three types of old growth in the project area, and delineate which of these have been included in your old growth network and which are slated for logging?
- 45 • Several alternatives include old growth stands which contain or will have new road construction within them. Why isn't this considered fragmentation if roads would fragment an old growth stand, would this affect their minimum size?
- 46 • Table C-6 infers that one-half of historic old growth for the Swan River State Forest is 18%, while the text infers it is 14.5% (one half of 29%). Elsewhere in the DEIS, it is noted that current old growth is 1.5 times (C-22) the level required, which indicates this level is 18%. Could you please clarify what your estimate of historic old growth is?
- 47 • Page C-21 of the South Wood DEIS notes that your old growth definition (over 150 years old and with at least 4 MBF per acre) does not determine the quality and value of these stands as wildlife habitat. This being the case, and since the purpose of old growth habitat is to maintain viable populations of plants and wildlife, why doesn't your "working definition" include a measure of wildlife value definition.
- 48 • Your "working definition" of old growth results in significant increase in your old growth estimate as compared to that defined in the Swan River State Forest Land Management Plan. Could you please define what was wrong with the original estimate?
- 49 • It appears that you have greatly expanded your estimate of old growth by including many, many acres which are not actually old growth. These acres would be defined in your working definition of old growth as low and medium quality old growth. Then you propose to log the high quality old growth, while leaving the medium and low quality old growth (non-old growth) for wildlife. This is amply demonstrated in the South Wood DEIS; most old growth (68%) that will be logged fits the "high quality" definition, while some is of "medium quality" (15%). No low quality
- Fine-sediment thresholds were openly acknowledged in the DEIS, pages III-22 and E-2. The consequences to management decisions when these levels are reached are referenced in the DEIS, page E-2. DNRC is meeting or exceeding all recommendations listed in the Flathead Basin Forest Practices Water Quality and Fisheries Cooperative Study. Road densities were analyzed in the water yield analysis and referenced in the DEIS, page E-7, and assessed in the DEIS, page E-8. DNRC could find no reference in the DEIS stating or implying that, "21 percent of the watershed has already been logged". Water Yield analysis results are found in the DEIS, pages D-4 and D-11, and referenced on page E-7. These results show that there are 2,878 ECA in the watershed, which represents approximately 18 percent of the watershed in ECA, and that the Woodward Creek watershed has a 7.1 percent increase in water yield over an unharvested condition. Harvest history data compiled to develop the water-Yield analysis shows that 5,866 acres or approximately 37 percent, have been harvested or exist in roads in the Woodward Creek watershed.
14. The matrix (DEIS, page E-8) does not disclose DNRC's intentions, but discloses the projected outcome of the proposed activities. DNRC intends to eliminate existing sources of sediment through the installation of surface drainage features and replacement and redesign of stream crossings that do not currently meet BMPs. These activities would be sufficient to rectify management-related sediment sources. DNRC does not find these sources sufficient to elevate the McNeil core results to current levels. Repair of these sites would not, therefore, move the sediment parameter

in the matrix to "functioning appropriately", but would improve over the existing situation.

- 50 • Old growth will be logged. Your old growth management strategy is simply a shell game; where you log the real old growth and leave the "fake" old growth for wildlife.
 51 • There is no discussion in your South Wood DEIS regarding retention of recruitment old growth. What is being done for this part of old growth management? How has DNRC considered the loss of old growth due to fire or other natural events?
 52 • Please define what the criteria are for delineation of corridors, or "blue"?
- 53 • Please define how many acres of the project area were delineated as corridors?
- 54 • How were recommendations provided by DNRC's panel of old growth experts (Plister et al. 2000) used in the delineation of corridors? For example, Are your corridor widths 600 feet wide to provide interior habitat, for example? Are your corridor widths 60 feet?
- 55 • Please provide a map of corridors that were delineated?
- 56 • Could you define the criteria for management of corridors? Are they required or optional?

- 56 • What is the impact on old growth habitat that is not connected with other old growth by corridors, or has no interior habitat? Do you increase old growth habitat to account for decreased effectiveness from fragmentation, or do you simply strive for a specific acreage regardless of quality?
- 57 • A panel of old growth experts selected by DNRC was asked to review the department's Biodiversity Guidelines. However, the conclusions of this panel are not noted or addressed in the South Wood DEIS. Why not?
- 58 • Although the panel of experts selected to review the Biodiversity Guidelines recommended that Option 2 not be used (Plister et al. 2000), the Swan River State Forest has decided to implement them anyway. The DEIS at C-19 notes that the Biodiversity Guidance adopted in May 1998 will be reviewed as the current procedure for managing for biodiversity and old growth on State lands. Why is the DNRC ignoring recommendations provided by Plister et al. (2000) that were adopted by the Land Board?
- 59 • A recent court decision identified a requirement that DNRC complete public involvement prior to implementation of the Biodiversity Guidelines. Yet these guidelines are being implemented in the South Wood project area prior to completion of public involvement and rulemaking (the DEIS at C-19 notes that the Biodiversity Guidance adopted in May 1998 will be viewed as the current procedure for managing for biodiversity and old growth on State lands). Why are you adding more timber sales in old growth without guidance that complies with the court's order?
- 60 • Although a panel of old growth experts selected by DNRC (Plister et al. 2000) recommended that the Green et al. (1992) definitions for old growth be used in the management of the Swan River State Forest, there is no mention of Green's guidelines in the South Wood DEIS. Could you please indicate how this recommendation for old growth was used in this analysis?

- 61 Land Board to use Green et al. (1992) as the guiding definition for old growth, these guidelines were not used in the South Wood timber sale. Why not? Please clarify which this timber sale is implemented.
- 62 • The panel of old growth experts (Plister et al. 2000) clearly noted that logging of old growth was an permanent solution and unproven results. Yet the South Wood DEIS claims that old growth habitat will be maintained on many acres in spite of logging. How do you reconcile these claims with Plister et al. (2000)?

Comments and Responses

- 50 The DEIS (Pages III-19 through III-20, III-23, D-5 through D-6, D-10 through D-11, and E-5 through E-6) states that sediment impacts generated by stream-crossing replacements would be short-term and would lead to a net long-term benefit to water quality and, subsequently, fish spawning habitat. Through these actions, DNRC is meeting goal objective 1 of the Restoration Plan.
- 56 15. The DNRC is dropping the bull trout matrix from use. The reason is that the bull trout matrix was created for use between USFWS and USFS. Many procedures contained within the matrix do not apply to State land management. In addition, DNRC reaches consultation with USFWS through a different section of the Endangered Species Act. For these reasons, it was determined that DNRC will not use the matrix in the South Wood Timber Sale Project EIS. Impacts to bull trout will be evaluated through different discussions (FEIS, page III-22 and III-23 and Appendix E).
- The Baseline Condition for Bull Trout (Gardner, 2000) completed by FNF was reviewed. The data collected as the basis for the Gardner report was also reviewed (*Cumulative Effects of MicroHydro Development on the Fisheries of the Swan River Drainage, Stephen Leathie, DFWP 1985*). Based on these reviews, DNRC has the following responses to comments on information shown in the matrix:
- Pool frequency was found to be low in all reaches. Based on this information, a rating of "functioning at unacceptable risk" is warranted. As stated in Gardner, "This may or may not be a natural condition." FNF conducted no field reconnaissance to verify these findings.

- 63 • Information provided in the South Wood DEIS clearly shows that logging will not maintain old growth values for wildlife. For example, the Boreal Owl and Flattened Woodpecker are defined as sensitive species, and both are associated with old growth. The DEIS notes at F-26 that the Pileated Woodpecker nests in dense old growth (basal area 100-125 feet per acre). So logging would destroy habitat by reducing stand density. Logging will also reduce stand decadence and hence suitable nesting trees. The DEIS also notes that the Boreal Owl requires stands with at least a 40% canopy coverage, and that this species is dependent upon the Pileated Woodpecker to create nest cavities. So thinning that eliminates habitat for the woodpecker will also eliminate both suitable nest habitat for the owl as well as the species it requires to create nest holes. The reference in the DEIS that thinned old growth remained suitable for the Pileated Woodpecker was incorrect in claiming that this species was not affected by logging.
- 64 • The Biodiversity Guidelines use cover types for old growth classifications, while Green et al. (1992) use habitat types. DNRC's panel of old growth experts (Piseli et al. 2001) recommended that the Green methodology be used, which required that habitat types be used to delineate various types of old growth. It appears that you are inventing your own classification for vegetation. If cover types is a standard acceptable means of delineating vegetation could you please provide a clear classification system, and the scientific references upon which this is based?
- 65 • The DEIS notes at C-3 that more than 95% of the South Wood project area includes the grand fir and western red cedar habitat types. Yet according to your cover types cedar is never even identified. Could you define which cover types for old growth contain cedar, and how this species is being addressed in old growth management? If cover types are being used to address biodiversity, why are some tree species excluded from your definitions?
- 66 • Define the approximate size and volume of cedar trees that will be harvested in each proposed unit, and estimate what proportion of the total volume will be cedar?
- 67 • Could you address the availability of large old cedar on the Swan River State Forest, what role this species plays in biodiversity, and how you intend to maintain it a old growth habitat?
- 68 • From Table C-6 in the DEIS, it appears that the State Forest estimates that one half of historic old growth is 18%. Why isn't this ever clearly stated in the DEIS for old growth management?
- 69 • The DEIS at C-21 states that historical levels of old growth in the SRSF were 29%. The DEIS at C-21 also states that current levels of old growth are 46%. What has caused this significant increase (60%) in old growth habitat in the last 70 years when of growth habitats elsewhere throughout the western United States has been drastically reduced?
- 70 • Miscellaneous
- 71 • The DEIS does not analyze the effects of converting mixed conifer cover type to larch/douglas fir cover type on cedar and spruce habitat types. How successful have DNRC been in doing this? What type of regeneration can be expected? How long will sites take to regenerate?
- 72 • The DEIS maps do not show roads on Plum Creek ownership. This information is important in order to get a clear picture of the extent of road and fragmentation that is currently on the landscape as well as thoroughly analyze cumulative impacts.

- Large pools (pool quality in the DNRC matrix) were rated as "functioning at risk." Pool quality is defined as pools greater than 0.8 meter in depth (KMF 1998). Pool depth was not gathered in the BPA and FWP study. If no data are available for a given parameter in the matrix, the parameter is assumed to be functioning at risk.
- Streambank condition was found to be good through a sediment-source inventory conducted by DNRC (Muhlfeld 1998). Based on these data, streambank condition is functioning appropriately.
- Riparian habitat conservation areas were determined to be functioning appropriately based on the BPA and FWP study finding that reaches not located in unconfined meadows had high amounts of cover from overhead vegetation. In addition, a review of aerial photography found that all reaches with recent timber harvesting had SMZs left. Those areas without SMZ tree retention were harvested in the 1960s and 1970s and have strong vegetative recovery in the riparian area.
- Peak and base flows are functioning appropriately based on the water yield analysis reported in the DEIS, pages III-18, D-4.
- Drainage network is functioning appropriately based on the sediment-source inventory completed in 1998 by the DNRC. No substantial sources of sediment from the road system were found; the road network was not found to be concentrating flow to a stream anywhere in the watershed.
- Disturbance history is functioning appropriately based on the water yield analysis reported in the DEIS, pages III-18 and D-4.

- Disturbance regime is functioning appropriately based on the following criteria set down by the USFWS guidelines for completion of the matrix:
 - stable hydrograph (as shown in 1976 stream gauging)
 - stable channels (as shown in 1998 sediment source inventory)
 - lack of debris torrents, scour events, or catastrophic fire
 - stable natural processes

- 16. There are no associated costs to the schools in terms of the timber sale. The appropriate costs are "opportunity costs" and the comparison of alternatives from the standpoint of trust management explicitly discusses the opportunity costs.

Additionally, no legal requirements are known to the Department that require a positive cash flow from a particular timber sale project, in order for that project to proceed.

- 17. The analysis did not discuss total school finance. Trust income is augmented by the State legislature in State aid to schools. In addition, schools are financed by local property taxes, which was mentioned in the DEIS. The DEIS clearly shows the trade-offs among alternatives in terms of school finance.

- 18. DNRC is not aware of a legal requirement that requires the preparation of a cost-benefit analysis in an EIS.

The analysis was done in March. Since that time, lumber futures prices have increased substantially, which verifies that a broader

- 72 • NEPA requires that a range of alternatives be analyzed; this DEIS analyzes alternatives that only cut a narrow volume of timber; all construct roads; threw out four log old growth.
73 • We believe a field tour to the area would be beneficial.

Sincerely,

Athena Montgomery
Athena Montgomery, Friends of the Wild Swan
for
Ryan Schaffer, Alliance for the Wild Rockies
Lauren Buckley, Ecology Center

average price used in the analysis was warranted.

Actually, the benefits reflect returns to the schools and are net of the costs of logging and related development expenditures. The use of the GNP deflator is common in using historical data. Unfortunately, the purchasing power of money typically declines. The Implicit GDP Deflator has been an excellent measure of inflation (a bit more conservative than the Consumer Price Index). The analysis includes a good representation of the variable (germane) costs associated with the project.

19. See remarks to Comment 18 as regards to fixed and variable costs. This is not a full-blown cost/benefit analysis. Were one to be done, we would need to examine the costs of contractors, as well as those of the public who take valuable time to comment on the project. Certainly the environmental analysis process is not cheap or free. The analysis done is germane to the mission of State trust lands and the project in question.

Additionally, DNRC knows of no requirement in the Montana Constitution that directs the content or procedures followed in the generation of a MEPA document. Nonetheless, all of the relevant anticipated costs for this project have been analyzed and disclosed.

20. The trust lands were granted to Montana in statehood. The school lands support the schools in terms of direct cash income and by influencing the property tax base in the State.

21. The idea that extensive timber harvesting may actually be reducing the support provided to the schools is an assertion without empirical basis.

- In fact, the opposite appears to be occurring. Of the 26 counties that account for 97% of the State's timber harvesting and, virtually, all of the wilderness, the rate of population growth is positively correlated with timber harvesting. Wilderness protection is not a factor that appears to be influencing population growth. A myth exists that if you cut timber, people won't move to Montana. While the cited report by Professor Power is not generally available, the alleged relationship between timber harvesting and out-migration versus protection and in-migration is a myth without empirical validity (Jackson and Keegan 2001).
22. See responses to Comment 18. Also a graph is on file for futures prices since the analysis was done. The Federal Reserve is pursuing an easy-money policy that stimulates the housing and timber market. Prices are responding as expected.
23. Responses to these comments are addressed in the SFMLMP.
24. with the recent road closures installed by DNRC and the additional road closures to be installed by Plum Creek Timber Company in August 2001, the Porcupine/Woodward Grizzly Bear Subunit will be in compliance with open-road-density standards set within the SVGBCA.
25. No roads are proposed in preferred habitat. Some proposed harvest units extend into preferred habitat. The acreage of preferred in proposed harvest units habitat by alternative follows:

ALTERNATIVE	ACRES OF PREFERRED HABITAT IN PROPOSED HARVEST UNITS BY ALTERNATIVE		
	EVEN AGED	UNEVEN AGED	0
A	0	16	27
B	0	0	13
C	0	0	13
D	0	0	0
E	0	0	13
F	0	0	13

26. DNRC is reviewing the Federal lynx conservation strategy to assess its pertinence to management of State trust lands.

The Lynx Conservation Strategy (Ruediger et al 2000) was used to develop the analysis for this project. Based on the following information, DNRC complied with the Strategy.

The suitable habitat parameters discussed in the Lynx Conservation Strategy were applied to the Woodward LAU. However, since denning habitat is not mapped on USFS or Plum Creek Timberlands, denning habitat constraints were only considered for DNRC lands. All the percentages in the Lynx Conservation Strategy are based on suitable lynx habitat in the LAU, not the area of the LAU. The amount of suitable lynx habitat in the LAU based on physical characteristics is 13,531 acres (FNF 2000); when unsuitable habitat stand conditions are considered, that figure drops to 12,668 acres (94 percent of lynx habitat in the LAU is suitable). This figure greatly exceeds the 30-percent figure discussed in the Lynx Conservation Strategy. Additionally, not more than 15 percent of lynx habitat was converted to unsuitable in the past 10 years.

Due to the data available, denning habitat was considered only on DNRC lands. Based on this SLI data and field verification, approximately 774 acres of denning habitat are believed to occur on

DNRC lands. None of the proposed units were determined to provide lynx denning habitat based on physical and/or vegetation conditions prior to treatment (*DEIS*, page F-10 and TABLE F-1-SUMMARY OF LYNX HABITAT MODIFIED UNDER EACH ALTERNATIVE). DNRC lands contain about 4,990 acres of suitable lynx habitat in the LAU. Therefore, approximately 15.5 percent of suitable lynx habitat on DNRC provides potential denning habitat. Regardless of the level of denning habitat, the proposed treatments are not expected to degrade potential denning habitat, but might accelerate the rate at which suitable denning habitat is developed.

27. Lynx foraging habitat was modeled using SLI (*DEIS*, page F-8). The effects of all alternatives on lynx foraging habitat were disclosed in the *DEIS*, pages F-9 through F-12. For a further discussion on the merits of basing an analysis on habitat characteristics verses documented presence of a species, refer to The Ecology Center response 19.

Habitat analysis detected that approximately 985 acres (7 percent of suitable lynx habitat in LAU) occur in early regeneration (less than 10 years since harvesting) and another 2,271 acres (17 percent of suitable lynx habitat in LAU) are expected to provide high quality foraging habitat (10 to 30 years since harvesting). Based on these figures, snowshoe hare habitat does not appear abundant and is expected to decline in future years; therefore, regeneration harvesting would be reasonable under the Lynx Conservation Strategy.

28. Connectivity and movement of lynx was inferred for Action Alternative B (*DEIS*, page F-9). Since these units occur at the edge of suitable

- habitat, lynx are not expected to move through these stands into unsuitable habitats. Therefore, converting these stands to unsuitable for a time is not expected to affect lynx movements. For the other alternatives, lynx connectivity and movement was discussed under Action Alternative C (*DEIS*, pages F-10 and F-11). Additionally, no harvest unit would result in severing travel corridors. In the discussion of the effects of this proposal on fishers, connectivity is discussed in more detail (*DEIS*, pages F-20 through F-23).
29. The habitat requirements of each species are discussed in the *DEIS*, pages F-19, F-21, and F-26.
- DNRC manages small patches of habitat scattered throughout the landscape. These patches are generally small and interspersed among other ownerships. The development of a viability analysis is unreasonable due to the limited amount of habitat provided by DNRC and the land ownership patterns. However, DNRC addresses the effects of their management on these species and contributes to conservation strategies developed in the larger landscape.
30. DNRC considered patch size, travel corridors, and connectivity in the development of the old-growth network. The target of the network was to include DNRC's commitment to the retention of old growth and choices needed to be made on which stands to include. There are numerous permutations available for defining a network, each with its unique benefits and shortcomings. DNRC believes this network encompasses a compromise of many different, often competing, concerns.

Pileated woodpeckers use relatively large blocks of old growth for nesting. Conversely, boreal owls use small patches within the landscape. Although the 2 species nest in different habitats, boreal owls rely on cavities excavated by pileated woodpeckers and northern flickers. Therefore, management of these woodpecker species is important to the management of boreal owls.

The effects to both species are discussed in the DEIS, pages F-19, F-20, and F-26 through F-28.

31. The approach of assuming all habitat is suitable unless "certain otherwise" is impossible and unreasonable from a statistical and analytical perspective. Statistically, the null hypothesis (absence) is never accepted (proven), it is only not rejected (disproved). For example, if you search for a species and never find it, you could never say it does not exist, you can only say that there is not enough evidence to suggest it exists. Conversely, if you search for an animal and find it, you can prove it exists. Research is predicated on this reasoning. Therefore, we can determine what constitutes habitat, but cannot be certain of what is not habitat.

Analytically, MEPA requires an analysis predicated on what is known about these species, with the recognition that there is a level of the uncertainty. The effects analysis followed DNR guidance and focused on critical or high quality habitat. Although there might be some variance from these habitats, the analysis focused on habitats that are documented to be productive. Please refer to the DEIS, Appendix F, for the habitat descriptions and the effects to those habitats.

32. The DEIS does not infer any information of the tree species used for nesting by boreal owls, but

- focuses on stands that contain subalpine fir and spruce, which is a documented component of boreal owl habitat (Hayward 1994). The DEIS simply described the habitat used by boreal owls in Montana, used SII data to model potential habitat, and assessed the effects to those habitats (DEIS, pages F-19 and F-20).
33. The effects of logging old growth and other stands are discussed in the cumulative effects discussion of the coarse filter (DEIS, pages F-6 through F-30).
34. The DEIS, pages F-21 through F-26, describes the amount and changes of preferred, suitable, and travel habitat for fishers. A map of modeled fisher habitat on DNRC lands is available in the project file.
35. The Swan River State Forest old-growth network was a proposed management tool to implement the 1998 Biodiversity Guidance as set forth in the SFLMP. Its development preceded any MEPA discussions with the Land Board regarding the Old-Growth Guidance Technical Committee's recommendations, which occurred in February 2001. (The Technical Committee is comprised of Jack Ward Thomas, Bob Pfister, Carl Fiedler, and Bill Baker.) As such, no commitments were ever made to that network. The 1998 Biodiversity Guidance is currently under review and will be revised along with the SFLMP to reflect changes in the law due to SB 354.
36. The selection process for the network was described by DNRC Forest Management Bureau wildlife biologist, Ross Baty, (*Considerations for Prioritization of Old Growth Stands for Networks and Deferred Areas, Feb. 18, 2000, Ross Baty, DNRC internal report*) and follows the

direction of the SFMLP Resource Management Standards BIO1, BIO2, and BIO3. Stands over 150 years old in the network comprise approximately 51 percent of the Swan River State Forest estimated amounts of naturally occurring stands over 150 years old, or 8,850 acres, as developed under the then-current biodiversity guidance and Resource Management Standards BI-06. The "quality" of old growth is a relative term, and the network includes a wide variety of considerations," as shown in Baty's report.

37. The South Wood DEIS old-growth analysis was completed before DNRC was able to identify and map old growth as defined by Green et al. The South Wood FEIS will account for the proposed project's effects to old growth using the Green et al. definition.
38. Timber harvesting in the existing old-growth network would be avoided by all the alternatives (DEIS, page II-2). Some alternatives would construct roads through the network to access other timber stands for harvesting. The road-building acres are included in the DEIS, Tables C-9 through C-16. Network road acres, specifically, are: Action Alternative B - 0 acres; Action Alternative C - 0 acres; Action Alternative D - 2.4 acres; Action Alternative E - 2.7 acres; and Action Alternative F - 0 acres.
- Since, other than road building, no harvesting would occur in the old-growth network and the network includes other stands to provide connectivity and buffering, no specific analysis was conducted for edge effects or blowdown.
39. The size of stands over 150 years old corresponds to stand parameters identified in DNRC's SLI.

40. See Baty's report, referenced in question 36, above.

41. The amounts of each attribute level for the project area are shown in the DEIS, Table C-7. The network contains 4,022 acres of high-attribute, 3,419 acres of medium-attribute, and 1,399 acres of low-attribute stands over 150 years old. Please note that the attribute levels are a cumulative inventory-based score adjusted for the cover type and do not necessarily represent a subjective evaluation of old-growth "quality", as inferred in the question. A description of the definition of attribute levels can be found in the DEIS, page C-23.

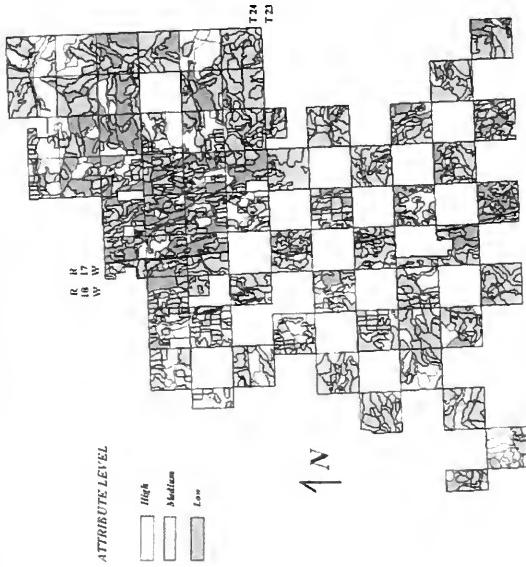
42. Refer to question 41.

43. The map on this page shows the old-growth attribute levels for all stands on Swan River State Forest. This map can be compared to maps in the FEIS or DEIS to determine what attribute level has been assigned to a stand. The process for determining old-growth attributes was set forth in the SFIMP and was intended as a management tool for stands that meet the definition of old growth in the 1998 Biodiversity Guidance. DNRC now uses Green et al for defining old growth.

44. Some alternatives do include roads in old-growth stands and stands over 150 years old. The roads would make an open corridor where there are none. The wildlife analysis includes several references to road density and the effects of road building for the alternatives. A decision to implement an alternative would consider the effects of roads through old growth.

46. There is an incomplete discussion in the DEIS on

FIGURE CR-1 – Old Growth Attributes of Swan River State Forest Stands



- page C-21. The average amount of stands over 150 years old from Losensky's historic data for the Upper Flathead Climatic Section is 29 percent (*page 33, Losensky, Historical Vegetation of Montana, 1997*). DNRC adjusted the estimated naturally occurring stands over 150 years old using proportional age-class distributions by climatic section and cover type for Swan River State Forest. The resulting amount of stands over 150 years old is 36 percent for Swan River State Forest (*pages 13 and 14, Old-Growth Management on Montana State Trust Lands, SFLMP, Draft Old-Growth Implementation Guidance, August 7, 2000*). One half that amount would be 18 percent. The acreage estimates in the DEIS are based on the 18-percent figure.
47. The working definition provides a means to identify stands over 150 years old from the SLI and a link to historical amounts of stands over 150 years old. Coarse- and fine-filter analyses, network delineation, old-growth attribute levels, and identifying specific stands for a harvest or other proposals allows for further evaluation of the relative values of individual stands across the landscape in a project-level EIS.
48. As directed by the Land Board in February, DNRC is now using the Green et al criteria for identifying old growth.
49. FOWS' reference to low-, medium-, and high-quality old growth is evidently equated with the low, medium, and high attribute levels displayed in the analysis. See DEIS, page C-23, and associated references for a discussion of attribute levels and their usage by DNRC. Since a combination of both subjective and objective criteria was used to develop the network as

outlined by Baty, a variety of attribute levels is included that support identification of the network stands. Applying the attribute levels as the only criteria for inclusion in the network would be appropriate since they do not represent the only considerations for old-growth values. The distribution of network attribute levels is similar to the Swan River State Forest attribute-level distribution (see DEIS, Table C-7, and FOWS response 41).

The old-growth timber stands proposed for harvesting are related to the design objectives for each alternative (DEIS, pages II-4, II-6, and II-8), and the acres proposed vary by alternative.

49. Recruitment old growth can be provided by several opportunities that exist. Prior to the passage of SB 354, there were 2.5 times the required acres needed to meet DNRC's previous old-growth commitment on Swan River State Forest (at the time the DEIS was analyzed). Fire suppression is currently reducing the risk of loss to existing old-growth stands by putting out small fires. Management actions, such as thinning, that emulate low-intensity fires promote diameter growth and provide potential recruitment stands. Replacing old stands that are breaking up due to diseases, insects, or other damage, provides young stands that would provide long-term recruit stands.
51. A description of the criteria used to delineate the old-growth network is located in the project file (*Considerations for Prioritization of Old Growth Stands for Networks and Deferred Areas, Ross Baty, 2000*).
52. Network old growth = 1,220 acres, mature glue =

- 967 acres. Mature "glue" was a term used to define mature stands (less than 150 years old, not old growth) that provided connectivity.
53. Corridors were planned along perennial streams in the project area. In all harvest units, a no-harvest buffer of 165 feet along perennial streams and 83 feet along intermittent streams would be retained. In all commercial-thin units, the harvest unit would continue to act as a forested corridor. In the seedtree units, the no-harvest buffers, plus the adjacent forested stands, would provide an adequate corridor. In all cases, except under Action Alternative B, the proposed harvest units would not decrease an existing corridor on DNRC lands to less than 600 feet. Under Action Alternative B, some forested corridors would be reduced to less than 600 feet; however, forested corridors along creeks and through other DNRC lands to Woodward Creek would continue to exist.
54. Refer to the Old-Growth Network Map (*DEIS*, page II-3) and the Proposed Alternative Maps (*DEIS*, pages II-5 through II-11).
55. The DEIS disclosed that harvesting in mature glue would occur under Action Alternatives B and C. DNRC committed to not harvesting old growth in the old-growth network, but did not make any commitments to "mature glue". The harvesting of "mature glue" might affect the old-growth network (*DEIS*, page F-5).
56. See Baty's discussion of network development and Resource Management Standards BIO-1 through BIO-3 for a list of factors DNRC considers when developing projects.
57. The DEIS analysis was conducted concurrently with

- work done by the DNRC-selected panel. Uncertainty connected with those recommendations and subsequent effects to DNRC's old-growth management would have been speculative to include at the time. Legislation (specifically SB 354) and litigation regarding the biodiversity rules adds more uncertainty. The DEIS analysis displays effects measured against identifiable criteria. The FEIS will display effects on Green et al stands.
58. Refer to question 57.
59. DNRC is currently in a rule-making process for its SFMP Biodiversity Guidance, as required under MAPA. Public involvement is part of MAPA. Temporary rules, which comply with Judge Sherlock's orders, were adopted by the Land Board on June 22, 2001. Temporary biodiversity rules were adopted by the Land Board on June 22, 2001. DNRC expects final rules to be in effect by early next calendar year.
60. Refer to question 57. The effects to Green et al old growth will be displayed in the FEIS.
61. The effects displayed in the DEIS are valid, based on the criteria used and its full application. The FEIS will analyze the effects to stands that meet the Green et al old-growth definitions.
62. This question evidently refers to the changes in old-growth-attribute levels displayed in the DEIS, Tables C-10, C-12, C-14 and C-16. Attribute levels are a way of evaluating recognized attributes associated with stands in the latter stages of development (DEIS, page C-23). The analysis quantifies these changes with inventory criteria and does not attempt to

- display that there will be no changes or quantify the associated changes to habitat or other values.
63. The contention that old-growth values for wildlife would be lost under any action alternative is incorrect. Timber harvesting might change or reduce habitat values for certain species; however, important structure (snags, live large trees, downed wood) would be retained to some degree under each action alternative. Depending on the rate of harvesting, which would depend on the prescription and the current stand characteristics, nesting habitat for pileated woodpeckers and boreal owls might not be eliminated (DEIS, pages F-19, F-20, and F-26 through F-29). The DEIS does not conclude that pileated woodpeckers would not be affected by this proposal, but states that harvesting might change habitat quality and quantity for pileated woodpeckers. (DEIS, Page F-27 and F-28), along with other species, in the short and long term.
64. Cover types are the standard measure for forest inventory. There are numerous references (see Bell, Log Scaling and Timber Cruising, pp 264 ff. Oregon State University, 1988, or any forest-cruising text). DNRC's SLI uses this methodology, where stands are inventoried by species composition and classified according to the desired criteria. Habitat types are also identified in the inventory and can be used similarly. The cover types in the DNRC Biodiversity Guidance are selected using a hierarchical search criterion that approximates the cover types used in the 1930s' inventory.
65. A wide variety of tree species occur on cedar

habitat types, depending on stand development, age, and history. Since cedar is a climax species, it can be present in many cover types and is frequently associated with mixed-species stands. In the project area, cedar is found in lodgepole pine, mixed conifer, western larch/Douglas-fir, and western white pine cover types. The only criteria for designation of a cedar habitat type are that cedar is present and reproducing successfully. As a climax species, it is common for cedar habitat types to be dominated by other overstory tree species. Cedar stands over 150 years old are included in the network for retention. The apparent exclusion of some species is a result of the selection criteria for SLI cover types. Cedar stands with large trees would most frequently fit into a mixed-conifer or western white pine cover type by default, because these are the last categories to be chosen, since they do not fit other types.

66. The sizes and volumes of cedar to be harvested vary by alternative. In general terms, larger-sized cedar trees and cedar stands would be harvested in the seedtree harvest units. A summary of cedar volumes and sizes estimated from the SLI by alternative is shown in the following table:

	Alternative				
	B	C	D	E	F
Estimated cedar volume (MBF)	1,229	474	584	555	437
Percent of total volume	20	9	11	10	10
Average cut diameter of cedar (inches)	14.3	11.0	11.2	13.3	12.1
Highest average diameter of cedar by harvest unit (section(s) and unit number(s))	16 inches (24-01 24-02)	12 inches (10-09 22-16 26-20)	12 inches (22-09 23-10)	16 inches (24-01)	16 inches (24-01)

67. Large old cedar stands are located on cedar habitat types in the Swan River State Forest. Cedar would be maintained as habitat under a coarse-filter approach, as outlined in the SFLMP Resource Management Standards BIO-1 and BIO-3.
68. The table figures are correct. Refer to question 46.
69. See question 46. The numbers listed do not intend to portray an increase in existing stands over 150 years old. The 36 percent is estimated naturally occurring stands over 150 years old from historic amounts in the Upper Flathead Climatic Section, adjusted for bias (page 13, DNR Old Growth Management on Montana State Trust Lands, SFLMP, Draft Old-Growth Implementation Guidance, August 7, 2000). The 46 percent figure is the existing condition on Swan River State Forest.
70. Cover-type designation is a function of species stocking in a stand. The western larch/Douglas-fir cover types are common on cedar habitat types. Cover-type conversions in stands proposed for commercial thinning would be accomplished by removing non-Douglas-fir/western larch species during the harvest and slash disposal, with no further treatment or regeneration needed. These treatments would increase diameter growth on the remaining trees and increase their dominance in the stand. In seedtree units, regeneration is typically prolific when an adequate seed source is provided. Adjacent seedwalls and seedtrees would provide the seed source. Brush field development would need to be reduced by prompt regeneration; precommercial thinning would probably be needed to adjust species composition and promote diameter growth.

71. All of the action alternative maps in Chapter II show existing roads for all ownerships.
 72. ARM, which govern DNRC's implementation of MEPA, define alternative as "an alternate approach or course of action that would appreciably accomplish the same objectives or results as the proposed action" (ARM 26.2.642 [2] [a][I]). The alternatives in this project were designed to meet the project objectives identified on Page 1-2 of the DEIS and address the issues that were identified through the scoping process.
 73. On July 2, 2001, Friends of the Wild Swan, and others, were taken on a field tour of the South Wood Timber Sale Project area.
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The Ecology Center

1. 77-1-202 MCA, in fact, states that "...These lands and funds are held in trust for the support of education and the attainment of other worthy objects helpful to the well-being of the people of this State as provided in the Enabling Act." This language does not permit the State to manage for any objective that might violate its fiduciary obligation to the school trust beneficiaries. The interpretation of this state suggested by the Ecology Center, Inc., would entail a violation of the Enabling Act and the Montana Constitution.
- MAB 9, 7/08
-
2. As stated in the Record of Decision (ROD) for the SFLMP: "A coarse filter approach assumes that if landscape patterns and process (similar to those species evolved with) are maintained, then the full complement of species will persist and biodiversity will be maintained." The South Wood Timber Sale Project proposes treatments that emulate natural disturbances such as fire or mortality due to insect infestation. These treatments strive to leave stands with a species composition, structure, and density that would historically occur on the landscape.
- The selection process for the network was described by Ross Baty (Considerations for Prioritization of Old Growth Stands for Networks and Deferred Areas, Feb. 18, 2000, Ross Baty, DNRC internal report) and follows the direction of the SFLMP Resource Management Standards BI01, BI-02 and BI-03. Stands over 150 years old in the network comprise approximately 51 percent of Swan River State Forest's estimated amounts of naturally occurring stands over 150 years old, or 8,850 acres, as developed under the then-current Biodiversity Guidance and Resource Management Standard BI-06.

The Ecology Center, Inc.

801 N. 8th Street, Suite E
Missoula, MT 59812

406-228-5933

406-228-5422 fax

Comments on the SFLMP

Dan Roberts, Project Lead:
Swan River's Natural Resources
Highway 3, South
Swan Lake, MT 59173
406-228-5422 fax
1-800-345-2118
Re: South Wood Timber Sale Project

Dear Mr. & Ms. 98:

I appreciate the opportunity to comment on the South Wood Timber Sale Project 1A in behalf of the Ecology Center and the Alliance for the Wild Rockies. These comments are intended to supplement those provided by friends of the Wild Swan in behalf of the Ecology Center and the Alliance for the Wild Rockies. We are concerned with the potential ecological impacts of the proposed timber sale on the Swan River State Forest, and particularly the impact of the timber sale on the habitat of the mountain caribou. We believe that the timber sale will have a negative impact on the habitat of the mountain caribou, and that the timber sale will have a negative impact on the habitat of the mountain caribou.

1. The timber sale must not pursue timber harvest to the detriment of other non-timber species associated with the forest, such as wildlife, habitat, clean air and clean water. As the potential ecological impacts of the proposed project has not fully understood due to the complexity of natural systems, the DNR should err on the side of caution in manipulating the ecosystem and its potential to provide valuable ecosystem services (e.g., air and water purification, carbon sequestration, climate stabilization, nutrient cycling).

2. The objective of promoting biodiversity is fundamentally inconsistent with the proposed project. Based on ecological characteristics of 1A-2, one can easily see that ecological systems are impossible for managers to completely understand in every detail, so it is prudent to management actions. Hence if seems inevitable that nonnative vegetation, introduced species, such as amorphans and arthropods, were not fully considered.

Old Growth

We are particularly concerned with the potential to deplete old growth habitat. While we feel that developing an old growth network that conserves the spatial distribution, patch size, and connectives of old growth is a productive means of ensuring species viability and conserving integrity, the ROD fails to adequately delineate the areas that have been designated as old growth. We request explanation of how the quality and distribution of old growth was considered in defining this objective. We request substantiation of the ability of the network to provide for the viability of old growth densities in species, in particular, those whose populations are tenured by the endangered species act.

3. The selection process for the network was described by Ross Baty (Considerations for Prioritization of Old Growth Stands for Networks and Deferred Areas, Feb. 18, 2000, Ross Baty, DNRC internal report) and follows the direction of the SFLMP Resource Management Standards BI01,

BI-02 and BI-03. Stands over 150 years old in the network comprise approximately 51 percent of Swan River State Forest's estimated amounts of naturally occurring stands over 150 years old, or 8,850 acres, as developed under the then-current Biodiversity Guidance and Resource Management Standard BI-06.

The Ecology Center

4. DNRC has considered the old-growth network from the initiation of this proposal. DNRC agreed to not harvest in the network or "fisher buffers" to retain travel corridors through the project area.
5. We request explanation of whether the old growth network accounts for the potential degradation of old growth characteristics associated with edge effects. Logging adjacent to old growth incorporated in the network, as proposed by this project, may alter microclimates and seed sources, substantially. Along the old growth attributes are the effectiveness of the habitat for old growth dependent species. We are concerned that if the DNRC does not retain a buffer around the old growth network, insufficient functioning old growth will exist to maintain the viability of old growth dependent species. As the DNRC is currently in the process of revising its old growth definition, forests possessing old growth attributes should now be counted in the land hand addresses the old-growth requirements of the 1996 State Forest Land Management Plan.
6. Old growth is an ecosystem state rather than a site-specific tree. Those species that are dependent on old growth ecosystems are primarily dependent on old growth characteristics rather than the presence of large trees. These old growth characteristics include high levels of tree class diversity and structural complexity, abundant stages, high levels of soil nutrients, and a rich understory of shade-tolerant species. The presence of old growth generally signifies a relatively undisturbed ecosystem.
- Actions in old growth management of Montana School Trust Lands by Pfister *et al.* (2000) included the following call for action in managing old-growth ecosystems:
- (G) the fact that old growth is believed to be in short supply, relative to post-cutting, those concerned with the ecological consequences of harvest and future management decisions will opt for the application of the "precautionary principle." In such cases, decisions are made with the acceptance of potential risk on the side of caution (Pfister *et al.*, 2000).
- Pfister *et al.* (2000) recommend old growth qualities that should be emphasized in management. They state that interior old growth (within edge of openings, lesser size stand, or road) reflects the most important component of old growth. Connecting linkages should be composed of closed canopy forest with a mature component and should contain a large fraction mature forest. Lower intensity managed zone should buffer old growth from more intense management areas. Additionally, priority for replacement old growth should be adjacent to existing old growth (Pfister *et al.*, 2000).
- Pfister *et al.* (2000) suggest that logging old growth stands down to minimum number of trees identified by old growth guidelines, such as Green *et al.* (1992), causes a change old-growth conditions (i.e., they question the potential to create old-growth habitats through active management). In other words, producing "old-growth" habitats through active management is an untested hypothesis. Scientists vary in their degree of faith in such manipulations, being successful in thinning natural processes.
- An old growth is an ecosystem state, the logging of old growth will eliminate or substantially reduce the ability of the stand to provide habitat for old growth dependent species. We are concerned that the project proposes known old growth to "enhance," or "protect and enhance" old growth attributes. In the vegetation section of the DEIS claims
- Corridors for travel were considered in the development of the old-growth network and this DEIS. The DEIS discussed the effects of the alternatives on the old-growth network (DEIS, page F-2).
- The contention that the proposed units might be a stronghold for a myriad of wildlife species is unfounded and unlikely. These stands occur along open roads and receive heavy firewood cutting and occasional salvage harvesting, thereby removing valuable old-growth habitat components. Due to many of these reasons, these stands were not incorporated into the old-growth network and prioritized for harvests above other stands.
5. The development of the old-growth network focused on connectivity and large patch size, along with many other considerations. The network consists of more than the "50% of historic old growth amounts" (the amount committed to in the SFMP) and includes areas labeled as "Mature Glue" to increase patch size or connectivity.
6. The project does not "propose logging old growth to 'enhance' or 'maintain' old growth attributes," as suggested in the comment. It does not propose "logging old growth stands down adjacent to the old-growth network (DEIS, page F-5).

- that logging's *facialis*; create western larch stands in old growth by selecting the stands from mixed species. 7. We agree that the forest should be set aside in this type of logging stand that possess these timber values, maintaining old growth in order to allow for watershed services and the retention of timber values makes both ecological and environmental sense.
- Given the fact that old growth is believed to be at least equally valuable to intact, cultures these concerns with the ecological consequences of current and future management decisions with 8. *for its application on the preexisting public lands. In fact, these decisions are made with the assistance of potential career on the side of caution (Hicks et al., 1991).*
- We are particularly concerned that some alternatives propose to conduct reads through old growth forests that should not be permitted within the network.
- Vegetation**
- Several alternatives, including alternative C, intend to promote the distribution of the forest structure component in mixed-glass, while the forest is still the forest was historically. 10. We request further explanation of how biological conditions that differ markedly from conditions activities intended to even old-growth conditions that differ markedly from conditions produced by natural processes, under the dynamic, native-like ecosystems, should be employed, resulting natural process of the only remaining inhibitors such as seeds rather than conducting static forest conditions
- We request consideration of claims that the old growth forests have developed increased susceptibility to 11. burning trees, due to climate change and moisture retention of old growth forest. It seems possible that disturbance to old growth trees through logging would increase the fire potential. We request abdication of statements to this effect in the following language:
- “*Venting off deadwood fuels, and shade-tolerant trees, which provide residual fuel load factors, make these old-growth stands more susceptible to burning than in the past (DPS III, 1991).*”
- Logging the stand is only one of the forest and remove the last flammable component, the tree holes
10. We are concerned about the potential for vegetation and soil disturbance to support previous seed propagation is not adequately analyzed.
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9. A further explanation of the fire hazards and risks and the potential effects of the proposed logging are given in the DEIS, pages C-17 through C-19. The susceptibility of the stands to burning is only compared in the DEIS to past conditions in the same stands, not to logged stands, and is further modified by the reference to drought conditions. DNRC agrees that the moisture regimes in these stands would reduce their general susceptibility to wildfires during average conditions, which is why they are in a long-term stand-replacement fire regime. When it burns, the weather conditions will be extreme, characterized by drought, and followed by hot, dry, windy conditions, which are only rarely experienced in the northern Rockies.
10. DNRC agrees that noxious weed propagation is a serious concern, and this project has potential to increase weeds. Current and proposed management practices are intended to reduce the spread and occurrence of weeds.
11. DNRC's primary objective in managing forest stands is to produce revenue for the trust beneficiaries. As such, the growth rates of forest stands represent an interest-bearing account that is important to the consideration of management treatments. DNRC would be remiss in its trust obligations if it did not consider growth rates, since timber management and harvesting is the primary means of producing revenue. In addition, however, DNRC follows the Resource Management Standards contained in the SFLMP, specifically BI01, BIO2 and BIO3, which address consideration of a wide variety of stand structures and functions. Growth rates are only one consideration of many when deciding on appropriate forest treatments.
12. We are concerned that the project appears to propose logging in streamside management zones in creeks without presenting a substantial risk to water quality and fisheries.
13. We request confirmation of whether the project will require a short-term exemption from Montana's Surface Water Quality Standards. While this possibility is present in the DEIS (I-3), this possibility is not further explored in the resource appendices. Given the potential for this sediment to detriment fish populations, we feel that the need to issue a short-term exemption should be thoroughly analyzed.
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16. We are concerned that the project appears to propose logging in streamside management zones in creeks without presenting a substantial risk to water quality and fisheries.
17. We are concerned that the analysis relies on equivalent element units without describing how the ICA thresholds¹⁴ the analysis area was delineated. The DEIS fails to acknowledge the uncertainty associated with using the Land-Grant Clearcut Act model. Given that several stream attributes have been found to be functioning at risk, it is unclear that mitigation of the water quality and fisheries is consistent with potential increases in water yield and sedimentation.
18. The DEIS does not appropriately assess the current levels and population dynamics of bull trout and other fisheries. The bull trout habitat rating matrix population and environmental base line discusses that numerous water quality parameters are functioning at risk or functioning at unacceptable risk. For several of these parameters (sediment, substrate, and road networks), the project would further degrade functioning at risk parameters. Without further information regarding population viability, this degradation of bull trout habitat is unreasonable.
19. Wildlife.
- The DEIS fails to adequately describe the presence of bats in the study's area. While bats may not use the study area extensively, the Project Area may provide habitat that is critical to population viability of bats. Populations of bats in the vicinity of the project area may function as a metapopulation; a population in which viability is maintained through the migration of individuals between patches of habitat. While the individual patches may not be utilized as habitat consistently, their habitat integrity is essential to the long-term viability of the population (Hanski and Gilpin 1997; Hanski 1994). As the DEIS discusses, that the DNRC has not developed a comprehensive plan for the maintenance of bat population, we request disclosure of the measures the DNRC has taken to ensure long term viability of bats in order to comply with the requirements for bats under the endangered species act.

- Comments and Responses
- 21 The DEIS states that the "habitat is probably not used by wolves due to the density of open roads." (DEIS p. 12-24) The DEIS should substantiate the lack of wolves in the analysis area.
- 22 We have commented that the soil delineated associated with the proposed project may degrade the long term productivity of the analysis area. For example, the 7% of the proposed harvest units impacted by alternative 1 could substantially degrade soil indicators. The DEIS relies on BMPs and mitigation measures to retain soil productivity. However, the DEIS fails to substantiate that the BMPs and mitigation measures are capable of preventing detrimental impacts to soils in the analysis area.
- Economics**
- 23 The economic analysis in the DEIS is inadequate as it fails to appropriately incorporate the costs associated with logging. We request disclosure of the degree to which future non-structural maintenance costs have been considered. Losses of ecological integrity should be considered in the economic analysis in terms of loss of habitat and ability of the lands to provide ecosystem services. The first presentation of the school funding provided by the revenue generated on state trust lands, by equating the revenue with financially supporting students, in the [4] is unreasonable and misleading.
- 24 Although we recognize that it is the policy of the DNRC to conduct a nondiscounted economic analysis that does not consider sufficiently future costs or non-monetary values, the narratives of the economic analysis do not make sense given the mission of the trust lands trust to maximize revenue from school trust lands. The future revenue generating potential of the trust lands must be considered. The proposed logging may not be financially responsible when considering potential future revenue generation from the sunset mountain area, the large scale soil and hydrology disruptions associated with the extensive site age logging project, and the removal of seed sources for natural regeneration may significantly degrade the integrity of the forest and future logging opportunities.
- While the DEIS' justification for school trust lands to consider in managing trust lands like Montana Surveyor's Cut has made clear that income generation should not be the only consideration, Maximizing income is not paramount to the exclusion of wildlife or environmental considerations. (Montana State Lands and Game Association v. Montana Department of State Lands, Montana Reporter, 158807 p. 24 17-10 September 29, 1995.)
- In economic analysis of State School Trust Lands states that the distinction between current cash flow and asset value is especially important to those charged with managing a trust. While a private commercial business has legitimately emphasize current cash flow, treating the long run value of the business as a game can be a secondary matter. A trust has a fiduciary responsibility that requires that the long term value of the trust be taken into consideration. A trust is not simply a commercial business. In the context of a trust, it is not unusual to sacrifice a potentially larger current cash flow in the protection of longer term resources, like water or timber.
12. The relation of proposed road building and timber harvesting to soils with high erosion potential and unstable soil types were addressed on page G-4 of the DEIS. No proposed activities would take place on unstable soils.
13. No known specific wildlife corridors occur in the project area. However, many wildlife species use and move through this area. Movement corridors and the effects of road building and disturbance were discussed in the DEIS, Appendix F.
14. With the recent road closures installed by DNRC and the additional road closures to be installed by Plum Creek Timber Company in August 2001, the Porcupine/Woodward Grizzly Bear Subunit will be in compliance with standards for open-road density set within the SVGBCA.
15. The DEIS notes that a 318 Authorization, which is issued by DEQ, may be required for the proposed culvert replacements and bridge rehabilitation. DFWP determines the need for a 318 Authorization during their review of the 124 Permit application. DNRC is required to have all potential alterations to a streambed or banks reviewed and approved by DFWP through a 124 Permit. The DFWP review ensures that all necessary mitigation measures and other stipulations to protect fish habitat and populations are met prior to the work being approved or completed.
16. The DEIS, page II-2, states that, "No timber harvesting would take place in streamsides management zones (SMZ) of creeks where bull trout populations exist." This statement is to confirm that all commitments to the Immediate Actions for Bull Trout Recovery (Flowers, 1994) would be honored on the South Wood Timber Sale Project.

No reference in the DEIS or appendices can be found that propose timber harvesting in an SMZ. None of the proposed harvest units would be located within an SMZ, as defined in MCA 77-5-301 through MCA 77-5-307, ARM 36.11.301 through ARM 36.11.310, and Procedures are defined in the SFMLMP Record of Decision, pages ROD-22 and ROD-23.

17. The DEIS, page D-2, states that, "Watershed Resource Management Standards 7 in the SFMLMP details the methodology for setting a water-yield-increase threshold. The procedure relies on evaluating the acceptable risk level, resource value, and watershed sensitivity." Resource Management Standard 7 states that, "To comply with the RMS, allowable water yield increases in the Stillwater, Coal, and Swan State Forests will be limited to levels which pose a low degree of risk to the beneficial water uses and watershed values." Figure 1 of Resource Management Standard 7 was used to determine the water yield threshold.

DNRC readily acknowledges that there is a degree of uncertainty in the use of any model to describe complex hydrologic and ecological processes. The relationships are based on research and are outlined in *Forest Hydrology, Part II* (1976) as stated in the DEIS, page D-2.

According to the sediment-source inventory completed in 1998, "Stream reaches are generally considered stable, with ample levels of LWD and natural grade breaks that aid in stream energy dissipation." The inventory also reports, "Initial results of the upland sediment source inventories in both the South and main Woodward Creek drainages indicate that roads are not contributing significant levels of sediment to

Suspect:

And on behalf of:
Ryan Shaffer
Famant Buckley
Ecovestigen Defense
Alliance for the Wild Rockies
The Ecology Center
Box 8731
Missoula, MT 59807

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- stream crossings." This report is referenced in the DEIS, pages III-18 and D-1-4. The water-yield analysis (DEIS, pages III-18, D-1 and 2, and D-9 through 12) details the expected water-yield impacts of the proposed alternatives. Research indicates that, "Reductions in forest cover of less than 20%... apparently cannot be detected by measuring stream flow, that is, by what has been termed the 'hydrometric method'" (Bosch & Hewlett, 1982). All action alternatives keep the watershed in a less than 20-percent equivalent clearcut condition. Therefore, changes in water yield at this level of harvesting would not be measurable in Woodward Creek. If water yield increases are insufficient to measurably increase the stream flow, it is highly unlikely that stream instability would result from water yield increases.
18. The DEIS, pages III-22 through III-23 and E-2, discusses the status of bull trout spawning in the Woodward Creek watershed. Spawning surveys are recognized as good indicators of bull trout populations. The sediment-source inventory referenced in the DEIS, pages III-18, III-22, D-2 through 3, and E-2, identified no substantial sources of sediment delivery to the creek or within the stream channel. DNRC intends to eliminate existing minor sources of sediment through the installation of surface-drainage features and the replacement and redesign of stream crossings that currently do not meet BMPs. These activities would be sufficient to rectify management-related sediment sources (affecting the sediment and substrate parameters in the matrix). DNRC does not find these sources sufficient to elevate the McNeil core results to current levels. Repair of these sites would not, therefore, move the sediment

parameter in the matrix to "functioning appropriately", but would improve the existing situation.

The impacts to fish habitat from new road construction, installation of surface drainage features, replacement of high-risk culverts, and rehabilitation of a bridge are discussed in the DEIS, pages E-5 and E-7. The sediment that would be generated by these activities is the reason that sediment and substrate would be degraded. The DEIS, page E-5, also states that these sediment increases would be of "short-duration" and would occur only "during the course of operation."

19. The DEIS analyzed for potential habitat and assumed lynx use the area. This approach is a more conservative approach than basing analysis and/or management on documented presence of a specific species. Lynx are elusive and occur in low densities; therefore, they are difficult to detect. Analysis and management based on confirmed lynx presence would result in less informed management decisions, possibly leading to a loss of important habitat for this species.

No evidence exists to suggest that this area might contain a metapopulation. However, the analysis in the DEIS addressed the effects to lynx and their habitat (pages F-8 through F-12). Travel corridors through the project area would be retained under all alternatives, thereby allowing lynx travel and use of the project area. Under all alternatives, lynx habitat would be retained and, potentially, enhanced in the long term. Seedtree units would develop high-quality foraging habitat, while commercial-thin units would increase the development of denning habitat by increasing tree growth rates.

DNRC is reviewing the Federal lynx conservation strategy to assess its pertinence to management of State trust lands. The Lynx Conservation Strategy was used to guide and analyze the effects of this project.

20. The Lynx Conservation Strategy (Ruediger et al 2000) was used to develop the analysis for this project. Based on the following information, DNRC complied with this strategy.

The suitable habitat parameters discussed in the Lynx Conservation Strategy were applied to the Woodward LAU. However, since denning habitat is not mapped on USFS or Plum Creek Timber lands, denning habitat constraints were only considered for DNRC lands. All the percentages in the Lynx Conservation Strategy are based on suitable lynx habitat in the LAU, not the area of the LAU. The amount of suitable lynx habitat in the LAU based on physical characteristics is 13,531 acres (Potential Lynx Habitat and Analysis Units [map and protocol], FWF 2000); when unsuitable habitat is considered, that figure drops to 12,668 acres (94 percent of lynx habitat in the LAU is suitable). This greatly exceeds the 30-percent figure discussed in the Lynx Conservation Strategy. Additionally, not more than 15 percent of lynx habitat was converted to unsuitable in the past 10 years.

Denning habitat was considered only on DNRC lands due to the data available. Based on this SLI data and field verification, approximately 774 acres of denning habitat are believed to occur on DNRC lands. None of the proposed units were determined to provide lynx denning habitat based on physical and/or vegetation conditions prior to treatment (DEIS, page F-10, TABLE F-1-SUMMARY OF

LYNX HABITAT MODIFIED UNDER EACH ALTERNATIVE: DNRC lands contain about 4,990 acres of suitable lynx habitat in the LAU. Therefore, approximately 15.5 percent of suitable lynx habitat on DNRC lands provide potential denning habitat. Regardless of the level of denning habitat, the proposed treatments are not expected to degrade potential denning habitat, but might accelerate the rate at which denning habitat is developed.

21. The analysis of wolf habitat is focused on critical habitats, specifically, denning and rendezvous sites. No wolf dens or rendezvous sites have been documented in the area (USFWS Wolf Report 1999), nor are wolves expected to use the habitat discussed (DEIS, Page F-17). However, contract stipulations require DNRC to notify USFWS if a den is located within 1 mile of the project area.
22. According to the SFLMP, "Within a timber harvest area, the loss or damage of soil productive capacity as a result of physical or biological impacts that exceeds 15 percent of native soil condition is considered significant. Detrimental soil impacts of compaction and displacement are considered significant when they exceed 20 percent of an area (USDA, BC Forestry)." The direct, indirect, and cumulative effects of the South Wood Timber Sale Project proposal are disclosed in the DEIS, pages G-3 through 5. The DEIS, TABLE G-1-SUMMARY OF DIRECT EFFECTS OF ALTERNATIVES ON SOILS, displays the maximum area of impact expected. Actual levels may be less, especially if additional mitigation measures are applied to affected areas.

Data on effectiveness of BMPs may be found in the Forestry BMP Audit Report (DNRC, 1990, 1992,

1994, 1996, 1998, 2000). Additional data on BMP effectiveness may be found in the SFMLMP monitoring reports.

23. The stumpage values are net of logging costs (stumpage minus the logging costs) and reflect the value bidders are willing to pay for standing timber where the purchaser is responsible for costs of logging and transporting logs to the mill. Hypothesized (by the comments), loss of ecosystem integrity and loss of habitat have no impact on school finance. The SFMLMP provides a broader economic context for all projects. The use of student equivalencies provides an additional way to examine alternatives beyond simply their cash equivalencies. It helps examine the relative merits of the alternatives. The complexities of school finance are mentioned in the DEIS (Page H-1).
24. The State inventory data indicates that State forests are growing faster than they are being harvested. In other words, current harvests are lower than that which can be sustained indefinitely. This sale will produce income for the current generation of Montana students, and the accumulation of inventory assures that future generations will be taken care of as well.

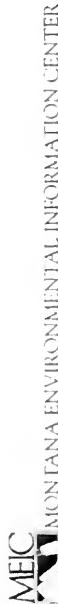
The Ecology Center, Inc.'s citation to Ravalli County Fish and Game Assoc. v. State of Montana Department of State Lands, 273 Mont. 371, 384, 903 P.2d 1362 (1995) omits a salient part of the sentence. The entirety of the court's sentence reads "Income is 'a' consideration, not 'the,' consideration regarding school trust lands; Maximizing income is not paramount to the exclusion of wildlife or environmental

considerations in the MEPA context." The Ravalli County decision was not a trust management case, but rather was a MEPA case. It does not stand for the proposition that trust lands may be managed for purposes other than income generation for the beneficiaries.

Professor Power, in the same 1996 report noted by The Ecology Center in a discussion of managing State trust lands for nonrevenue values, notes that: "The lost income (if any) associated with amenity-driven management could then be deposited in the school trust account by the State legislature for the use of the trust land to provide those amenities." Professor Power clearly recognizes that the State's fiduciary obligation can only be met if the value lost to the beneficiaries by producing the amenities sought by some is returned to the trusts from another source.

**Montana Environmental
Information Center**

1. The DEIS analyses were conducted concurrently with the Technical Review Team's work. The uncertainty connected with those recommendations and subsequent effects to DNRC's old-growth management would have been speculative to include at the time. Legislation (specifically SB 354) and litigation regarding the biodiversity rules adds more uncertainty. The DEIS analysis displays effects measured against identifiable criteria. The FEIS will display effects on Green et al stands.
2. The Green et al map will be displayed in the FERS.
3. The effects of harvesting timber on old-growth-associated species were discussed under the Fine-Filter Analysis (DEIS, pages F-5 through F-30).



MONTANA ENVIRONMENTAL INFORMATION CENTER

May 8, 2004

Mr. Dan Robertson
DNRC
Sp-71 Hwy 84 South
West Glacier, MT 59931

Submitted via fax 406-254-2981

Re: Southwood Timber Sale

Dear Mr. Robertson,

I am writing in response to your letter.

The following comments on the Southwood Timber Sale are respectfully submitted on behalf of Montana Environmental Information Center (MEIC). We are concerned that the proposal will have negative impacts upon old growth and old growth dependent species. MEIC strongly urges DNRC to take more inventory with this or any other timber sale in old growth units clearly articulated procedures are in place that are consistent with the Scientific Techniques it views

The Land Board adopted the recommendations of the Technical Review Team with the sale appears to be in conflict with those recommendations for the reasons we outline below

1) The Southwood Timber Sale does not use the Green et al definition to identify old growth

2) The Southwood Timber Sale appears to rely on an out-of-date map outlining the location of old growth on the landscape. Our understanding is that there is a more current map available that employs the Green et al definition. We urge you to use this map

3) It is unclear from your proposal how the logging of high attribute old growth as defined in the option 2 approach will impact old growth dependent species. The Scientific Technical Review Team recommended "throwing out" Option 2 in favor of a more scientifically proven approach to define old growth (Green et al)

We'd like to know why DNRC is not following the recommendations of the Scientific Technical Review Team

In addition we have concerns with the economic analysis. We question the accuracy of DNRC's assertion that logging in the Southwood area will put 25 jobs through school. The funding mechanism associated with school trust lands is actually quite complex and far from

MEIC

Mr. Dan Robertson, 1111 1st Street, Helena, MT 59601 Telephone: 406/254-2981

Fax: 406/254-2981

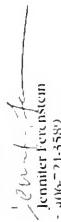
E-mail: daniel.robertson@dnrc.mt.gov

**Montana Environmental
Information Center**

a direct causal relationship. We request that you rewrite this section to more accurately reflect the realities of school funding.

Thank you for considering our brief comments. We hereby incorporate the comments submitted by Friends of the Wild Swan and hope that you will carefully consider and reply to each substantive comment.

Sincerely,


Jennifer Fercstein
406-215-5889

F.H. Stoltze Land and Lumber Co.

Most of the stands proposed for commercial thinning are at the low end of merchantability standards. Leave trees would range from 8 to 12 inches diameter, on average. Where older stands are proposed for thinning in Action Alternatives C and E, one purpose is to retain the Douglas-fir/western larch cover types and some old-growth attributes in the stands. Growth rates would not likely be increased substantially in these stands.

F.H. STOLTZE LAND & LUMBER CO.



F.H. STOLTZE
LAND & LUMBER CO.
LAND OWNERSHIP

Timber Manufacture
Bx-1424 • Co-1504 • M-1425-29112
Phone: (406) 247-2414 • (406) 277-1812
E-mail: stoltze@olympus.com

April 24, 2001

Robert Sandman

Unit Manager
Statewide State Forests

53741 Highway 83 South
Swan Lake, Montana 59911

Re: Comments on South Wood Timber Project Draft Environmental Impact Statement

Dear Bob,

I am writing to offer a few brief comments in support of Action Alternative E of the South Wood Timber Sale Project DEIS. As I stated in my previous letter on this process in the last several years the Swan River State Forest's timber sale program has provided very little harvest volume contribution toward the annual timber harvest on State Trust Lands as mandated by State law. I believe that it is very important that more timber management must take place in this area. Timber management should continue to be the primary source of revenue for the state in the foreseeable future and the primary tool for achieving biodiversity objectives while improving forest health and productivity. This South Wood Timber Sale Project is a key to getting a much needed timber sale program on the Swan State Forest back on track. Although Alternative E of the South Wood DEIS does not generate the largest return to the school trust, I believe it's value in providing funding to improve the existing road system and developing access into areas to manage timber in the future will be more valuable in the long term. This alternative also proposes to treat more acres than the maximum revenue alternative, Alternative B, using a combination of selective and commercial thinning harvests to mimic a severe and stand-replacement fires. Proposed treatments would, in the long-term, move timber stands toward a desired big class, species composition, structure, and density that were historically present across the landscape.



I believe the combination of seed tree harvest and commercial thinning as prescribed in Alternative E will create a mosaic that more accurately mimics variable fire intensities and historic stand conditions than harvested prescriptions in the other proposed alternatives. The only concern that I have about these silvicultural

prescription is the number of leave trees called for in the commercial thinning prescriptions. Leaving 100 trees per acre, which is approximately a 20-foot spacing, is good average spacing for smaller to medium sized trees. If the majority of the leave trees are large diameter trees which are in the fifteen inch or larger diameter range, an average of a 20 foot spacing would not open up these stands enough to create adequate growing space to insure long-term stand health and productivity. I like the proposal for retention of scattered clumps of western red cedar with full crowns and healthy young trees in the understorey of the seed tree harvests to provide wildlife screening, stand structure and increase species diversity. Other than the one concern that I have about leave tree spacing, I believe the harvest prescriptions in action Alternative E will do far more in terms of moving these stands toward a more healthy and vigorous condition while maintaining the appropriate species than any of the other proposed alternative.

I believe that the proposed mitigation measures are reasonable and feasible while providing more than adequate protection of all other resources. All of the action alternatives were designed to be within the allowable water yield increases for the Main Woodward and South Woodward drainages and would implement the Governor's recommended actions for the restoration of bull trout. All action alternatives commit to no harvesting within the Swan River State Forests identified old-growth network. All action alternatives will also remove native and undesired culverts, upgrade road-surface drainage and remove an old wooden bridge that will reduce sediment delivery into streams. The implementation of Alternative E or any of the other action alternatives will have very little, if any, adverse environmental effects.

Under any of the alternatives the roadwork, logging, and slash treatments planned must be practical, and economically sound. There is no question that "Best Management Practices" must be met, however over compensation is not a wise and prudent use of our forest land resources.

Stoltze would like to see Alternative E of the South Wood Timber Sale Project implemented. Alternative E will generate a substantial return to the school trust in the next few years and should also contribute to the long-term forest health, productivity, and revenue generating capabilities of the harvested stands in the long-term. The implementation of this timber sale proposal is critical to the survival of the Stoltze sawmill and other wood products facilities in our area that contribute to our local economy. Thank you for the opportunity to comment on this proposal.

Sincerely,

Tom Timlinger
Forester

1. The Administrative Rules of Montana (ARM), which govern DNRC's implementation of MPPA, define alternative as "an alternate approach or course of action that would appreciably accomplish the same objectives or results as the proposed action." (ARM 26.2.642[2]a)[1]). The alternatives in this project were designed to meet the project objectives identified on page I-2 of the DEIS and address the issues that were identified through the scoping process.
3. The SVGBCA directs cooperators to retain less than 33 percent of a subunit with open-road densities greater than 1 mile per square mile. All roads that are proposed would be managed as restricted; therefore, the open-road density would not be affected by this project. Several closures were installed in July on DNRC lands to reduce the amount of area in the subunit in excess of the standards for open-road density. Closures on Plum Creek Timber Company lands are scheduled for August. The combination of these closures will reduce open-road densities to less than 33 percent, thereby complying with the SVGBCA.
4. A 1998 sediment-source inventory of the Woodward Creek watershed found no in-channel or upland sources of sediment to Woodward Creek. This includes all roads and harvested areas (DEIS, pages III-18 through III-19 and D-1 through D-4). The fisheries analysis is found in the DEIS, pages II-22 through II-23 and E-1 through E-8. This analysis details the expected impacts to bull trout and bull trout spawning habitat.

May 7th

To Dan Robertson
Swan River State Forest
From Roger Sherman
1370 4th ave W/N
Columbia Falls MT

Three of the four actions in the DEIS written for the South Wood Timber Sale will log old growth forest habitat. This is not acceptable based on the following:

1. The DEIS analyzed a narrow range of alternatives. All alternatives build roads and logging volume is almost the same. All alternatives but one logs in old growth.
2. Plum Creek has been logging and building roads in the Woodward/Whitetail area for the past few years. DNRC must comply with the court's directive that they conduct a thorough cumulative effects analysis
3. Under the Swan Valley Conservation Agreement DNRC must be reducing, not increasing road densities
4. The action alternatives log and build roads in lynx habitat and the Woodward Creek is a bull trout spawning stream and the fine sediment produced by logging will certainly destroy their habitat

Sincerely

Roger Sherman

Comments and Responses

INDIVIDUAL OR AGENCY COMMENTS
(NON-WRITTEN)PROJECT: South WoodDATE: 4/23/01PERSON/AGENCY COMMENTING: Randy Gordon / Kyle Luckow
ADDRESS: South Bonneville Bldg 5991 71244 Hwy 83

PHONE:

TYPE OF CONTACT (PHONE, OFFICE VISIT, ETC.) —NAME OF PERSON RECEIVING COMMENTS: Dave Roberts

COMMENTS, QUESTIONS, POINTS OF EMPHASIS, ETC.

We'd like to see a combination of Alternatives B & C implemented. They like the idea of building roads for future management and salvage of stands where needed but Alternative E implements also want to see more regeneration treatments in older stands like Alternative B implementations. They like the results of areas where we have done this type of treatment in the past and the success we have had in regenerating western larch, Douglas-fir and western white pine.

They also said they are informed of the political obstacles that face these alternatives with respect to harvesting in old growth. They are not opposed to Alternative D if it will result in a timely and doable project.

YOUR RESPONSE (VERBAL) WRITTEN, MAPS, MAILED RESPONSE, PROMISED.

ETC.

We discussed about the MAFRA requirements and HB 354 with respect to effects on harvesting old growth and possible delays until these are passed out. I said their comments would be taken into consideration and presented in the FETS.

INDIVIDUAL OR AGENCY COMMENTS
(NON-WRITTEN)

PROJECT 4th Floor
DATE 5/21/61
PERSON/AGENCY COMMENTING: Abd'l Maqied
ADDRESS C 2147 Sherman Avenue
PHONE: _____
TYPE OF CONTACT (PHONE, OFFICE VISIT, ETC.) Office Visit
NAME OF PERSON RECEIVING COMMENTS: John Rabbia
COMMENTS (QUESTIONS, POINTS OF EMPHASIS, ETC.)
Point A and B. Let us know what he supports
Alternative B because it brings do most
victims to the front

Comments and Responses

Meyer

YOUR RESPONSE (VERBAL, WRITTEN, MAPS, MAILED RESPONSE, PROMISE,
ETC.)

"Marked Viva and visit in the project

Sturgis

Mr. Leonard C. Sturgis (4467)
Arizona State Forest Ranger
Medicine Hat,
A.C.B. #320
Florence, Arizona 85232-3300
May 3, 2001

Mr. Robert
San River State Forest
58741 Highway 22 South
Dumont, MT 59821

Mr. Robert:

I am 4 years old and that older & I am a reporter of the
group Friends of the Old San Juan. I own land 370 acres about the
area. I have been on "arbor" plan since the first "Earth Day" observance.
I will be testifed on board 2001.
Just learned of UNRIS just released draft Environmental Impact
Statement for the proposed South Wood Timber Sale on the San Juan
State Forest. I want a copy of that statement as soon as possible.

Thank you,

Jeff Sturgis #4467

→ The number 4467 must follow my name upon any mailing sent to me,
or poison staff will return mail to sender.

William C. Sturgis #89467
P.O. Box Store Room Lamp Express
Maine's Emp.
Florence, Maine 04376-3300
May 19, 2001

Dear Doctor Shadforth,
Dear Doctor Shadforth
58 Main Street
Somerville, MA 02144

Mr. R. W. S.

Apparently you sent me ~~me~~ I requested of your Unitodality,
the address above in Florida by accident you mailing a bad or
faulty fixture "accidentally" from Department of Corrections "mailbox"
misdirecting them & returning "postmarked" "postmarked" "postmarked"
from FL. However, ~~you~~ subsequent messages returned to you. With
out ~~return~~ it remains ~~me~~ until addressed!

Please accept a copy of what I want after my last, due release:
Upon return to 40, 40, 40, 40, whatever I wish.

I do thank you, though for mostly ~~what you did~~.

Bill Sturgis

Swan View Coalition

1. An intensive road log is being conducted for the South Wood Timber Sale Project. This road log will include all sediment sources on proposed haul routes in the project area. The standard procedure is to create a road log with stipulations and specifications that are included in the Timber Sale Contract. All road improvements, surface-drainage features, ditch-relief structures, and stream crossings (new construction, replacements, and rehabilitations) are included in the road log.
2. The report completed by Muhlfeld states that, "While minor downcutting is evident, it is difficult to ascertain whether this adjustment is natural or a result of increased water yield." Figure 1 is of watershed Resource Management Standard 7 was used to determine the water-yield-increase threshold in the DBIS. No documentation of use of Figure 1 was found for the 10-percent value recommended in the 1998 report.

Dear Dan:

Thanks a lot for the July 2 field tour of the South Wood Timber Sale Project. While we did not receive the DEIS in time to comment by May 9, please accept these comments into the formal record and consider them in your final environmental impact statement. Please also place us on USFS's mailing list so we will receive any such timber sale and road management documents in a timely manner in the future.

Firstly, let us say that we support the several road closures you recently announced to comply with minimum grizzly bear security standards. It is unfortunate that Bigfork Eagle activists, such as misleading and inflammatory headlines to its news article in this regard. We wrote a letter to the editor about this and have included a copy for your records.

Secondly, however, we feel that not enough is being done to address the effects of road building on the water quality and fisheries. In short, complying with the Swan Valley Grizzly Bear Conservation Agreement grizzly bear standards are not enough to protect these other resources. We think the following factors problematic and ask that you address and rectify them in the DEIS:

1. John Muhlfeld's sediment source survey finds that "In general, road drainage is in poor condition throughout the road system." While he finds no significant sources of sediment delivery from roads, he finds "An intensive road log is warranted to identify and remedy these sites," and reports that the amount of fine materials in spawning gravels in Woodward Creek warrant its listing as threatened.

We urge you to conduct the intensive road log and sediment source survey necessary to supplement Muhlfeld's preliminary analysis of potential sediment sources. It is not enough to simply list the watershed as functioning at unacceptable risk and as likely to further degrade, with the effects of the proposed

3. The open road-density standards in the SVGBCA area are based on grizzly bear subunits. Many of the subunits in the SVGBCA area are comprised of 3 major ownerships: USFS, Plum Creek Timber Lands, and DNRC. Under the Endangered Species Act, these entities have different responsibilities. The USFS is required to aid in recovery of species, while Plum Creek Timber Lands and DNRC are required to avoid "take". Amendment 19 requires the USFS to limit open-road densities to less than 19 percent in subunits predominantly, (more than 75 percent) comprised of National Forest System Lands. In the Woodward-Porcupine Grizzly Bear Subunit, National Forest System lands comprise 41 percent of the subunit. Under Amendment 19, a no-net gain of open-road densities is required. The SVGBCA requires a threshold value in the agreement area

Swan View Coalition

3185 Foothill Road, Kalispell, MT 59901

*Keeping an eye on the Swan Mountains and America's public lands!

July 11, 2001

Dan Robertson - Project Leader
Swan River State Forest
8371 Hwy 83 South
Swan Lake, MT 59911



that the cooperators agreed to meet. This threshold required cooperators to decrease, not maintain, the open-road density in the subunit. With the recent road closures, the cooperators met their commitments under the SVGBCA, thereby reducing the risk of grizzly bear mortality and disturbance/displacement. Further road restrictions might occur to reach the 21 percent long-term goal; however, these restrictions would be voluntary and need to fit into the mission of the cooperators.

action (DEIS at E 8) If no significant sediment sources from roads have been identified during the preliminary survey, then a more intensive survey is required to find and review what ever number of gravel or leased sources are currently putting the watershed at risk. Given the large number of roads in the watershed, careful road obliteration may be required to reduce total road density and restore disrupted water channels and drainage systems contributing to sediment problems to increased water yield and recommends a maximum 10% water yield increase. The DEIS at D-19, however, uses a 12% allowable increase.

Regardless, if some stream reaches are experiencing sediment delivery from lateral bank erosion or down-cutting at 6.8% current water yields, it appears risky to either assume extra care need only be applied upstream of those reaches or to assume that further/compounding water yield increases, even on the order of the same 15% estimated, will have no negative effect on other stream reaches in the watershed. After stream reaches begin to unravel is no time to discover water yield has become excessive.

3. A reading of FWS's biological opinion on the Swan Valley Grizzly Bear Conservation Agreement reveals that the road density standards set forth will not provide the security necessary for females with cubs to set up home ranges in the Swan Valley. Moreover, the 33% open road density standard set forth in the Conservation Agreement is far in excess of the 19% standard used elsewhere by the Flathead National Forest. We urge DNRC to voluntarily lower its open and total road densities further than required by the Agreement to provide better habitat and security for not only grizzly bear, but for other wildlife and fisheries as well.

Again, thank you for an informative field tour and for considering these comments. Please keep us posted and send us the FEIS.

Sincerely,


Keith J. Hammer
Chair

enclosure

Doubled column document with its appendices were published at an approximate cost of \$11,56 per copy for printing and \$3.00 for mailing.



DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
SWAN UNIT OF PITCH-SWAN RIVER STATE FOREST
3874 HIGHWAY 83 SOUTH
SWAN LAKE, MT 59871
(406) 734-2291

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